FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

VOL. 104
No. 2175

JUNE 19, 1958

Registered at the G.P.O. as a Newspaper

Offices: John Adam House, John Adam St., London, W.C.2

Single Copy, 1/-. By Post 1/4. Annual Subscription, Home 52/-, Abroad 60/- (Prepaid)

UNIVERSITY OF MICHIGAN
JUL 8 1958
ENGINEERING LIBRARY

The most successful

economical

and widely used

MOULDING BOX

in the world

over 60 standard styles and sizes | write for catalogue

Sterling

found in 9000 foundries

STERLING FOUNDRY SPECIALTIES LTD. BEDFORD · ENGLAND

NARROW GANGWAYS · LOW HEADROOM ARE NO PROBLEM

YARD CLEARING · ASH CLEARING TAKES LESS TIME

Muir-Hill Regd.

BUILT BY BOYDELL

Are these your bulk handling problems—then the Muir-Hill LH-1 10·5 cu. ft. hydraulic loader can help you too. As a first step send for the LH-1 brochure.

LH-1 HYDRAULIC LOADER

E. BOYDELL & CO. LTD., UNIVERSAL WORKS, OLD TRAFFORD, MANCHESTER, 16

dmEB.743

FOUNDRY
TRADE JOURNAL

Vol. 104 June 19, 1958 No. 2175

Established 1902
Incorporating
IRON & STEEL TRADES JOURNAL

Single copy 1s.; *by post* 1s. 4d.
Annual subscription: home 52s., *abroad* 60s. *(prepaid)*

Editor:
V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.
Commercial Editor: P. E. CARDEN

Advertising Manager:
F. BARRINGTON HOOPER, B.A.

Production Manager:
R. J. LOVELL

Publisher: H. J. DWYER
Circulation Manager: E. T. GRIFFITHS

District Representatives:
G. P. ELLIOTT (Northern Area)
T. H. SMITH (Scotland)

The FOUNDRY TRADE JOURNAL is the official organ of the British Steel Founders' Association; Association of Bronze & Brass Founders; Light Metal Founders Association; Foundry Trades' Equipment & Supplies Association; and the National Society of Master Patternmakers.

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Every Thursday by Industrial Newspapers, Limited

BARRINGTON HOOPER, C.B.E.
Chairman and Joint Managing Director

F. BARRINGTON HOOPER, B.A.
Joint Managing Director and Commercial Director

F. R. LEWIS, JOHN HOOPER, D. HORN
Directors

E. G. WESTON,
Director and Secretary

JOHN ADAM HOUSE,
17-19, JOHN ADAM STREET,
ADELPHI, LONDON, W.C.2

Telephone: Trafalgar 6171 *(Private Branch Exchange)*
Telegraphic Address: "Zacatecas, Rand, London."

PRINCIPAL CONTENTS

Page

Influence of Vacuum Melting on Properties of Various Materials

By W. F. Moore and A. J. Kiesler

Presented at the 1957 European Investment Casters' Conference, the paper presents the results of a study into the effect of vacuum melting on the mechanical properties of a range of materials, comprising both those which can be produced by conventional methods and so afford data for comparison, and those which, because of composition, must be vacuum melted 741

Institute of British Foundrymen—Technical Sessions at the Buxton Conference

Continuing the "on-the-spot" accounts of the Buxton proceedings, this final section includes abstracts or synopses of all the technical papers, and notes on some of the principal matters arising in discussion 747

Mechanized Handling in the Small Foundry

The article describes the transformation in handling methods effected by the use of the fork-lift truck at a Birmingham foundry, and emphasizes the benefits which can be obtained by such simple and economic applications of the principle of mechanization 757

Influence de Fusion en Vide sur les Propriétés de differents Matériaux.
Par. W. F. Moore et A. J. Kiesler.
Présenté en 1957 à la Conférence des fondeurs en moulage à la cire perdue, cet article décrit les résultats d'une étude sur l'effet de la fusion en vide sur les propriétés mécaniques d'une variété de matériaux comprenant aussi ceux que l'on peut produire par les méthodes conventionelles. Il apporte des informations pour comparaison avec ceux qui, à cause de leur composition, doivent êtres fondus en vide. 741

Einfluss des Schmelzens im Vakuum auf die Eigenschaften verschiedener Werkstoffe. Von W. F. Moore und A. J. Kiesler.
Dieser im Jahre 1957 auf der europäischen Konferenz der Feingiesser gehaltene Vortrag unterrichtet über die Ergebnisse einer Untersuchung zum Studium des Einflusses, welchen das Schmelzen im Vakuum auf die mechanischen Eigenschaften einer Reihe von Werkstoffen ausübt. Da die Versuche sich auch auf solche Werkstoffe erstreckten, die durch die üblichen Methoden hergestellt werden können, ergaben sich Vergleichsmöglichkeiten mit solchen Werkstoffen, die wegen ihrer Zusammensetzung nicht anders als im Vakuum geschmolzen werden können. 741

Mécanisation de la Manipulation dans les petites Fonderies.
Cet article décrit la transformation des méthodes de manipulation effectuée grâce à l'utilisation de chariots élévateurs à fourche dans une fonderie de Birmingham. Il souligne les bénéfices que l'on peut obtenir par de telles applications, simples et économiques, du principe de la mécanisation. 757

Mechanisierte Förderung in kleinen Giessereien.
Der Bericht beschreibt die Umstellung der Förderungsmethoden, die durch Verwendung von Gabelstaplern in einer Giesserei in Birmingham erreicht wurde und betont die Vorteile, welche durch solche einfache und wirtschaftliche Anwendungen der Grundsätze der Mechanisierung erzielt werden können 757

Features, News, Commercial Information and Statistics

Leader: Conditions of Purchase 739
Investment Founders' Technical Association 740
Birmingham University Post-graduate Course 740
Cleveland Show Comment 740
Equipment and Supplies 746
Birthday Honours 755
Notes from the Branches 759
News in Brief 761
Personal 764
Changes of Name 765
Contracts Open 765
Raw Material Markets 766
Current Prices of Iron, Steel and Non-ferrous Metals 768
Company News 770

The Modern Portable Unit

for MIXING LOAM

Photograph published by courtesy of E. GREEN & SONS LTD., WAKEFIELD

This small production unit for mixing loam, sands for the CO_2 process, oil sands, facing sand, etc.—has won widest popularity because it fills so efficiently a long-felt foundry want.

● *Photograph shows* Porto-Muller, discharging mixed loam for use in core-making. This portable unit—the smallest production size in our range of spring-loaded mix-mullers, handles approximately 200 lbs. (discharged weight).

Made also with a fixed understructure where portability is not required.

AUGUST-SIMPSON Porto-Muller

Sole licensees and manufacturers for the British Empire (excluding Canada, Australia and New Zealand) of the Simpson Sand Mixer.

AUGUST'S LIMITED · HALIFAX . ENGLAND

Telephone - Halifax 61245/6/7/8 Telegrams : Augusts, Halifax

I.J.M.

FOUNDRY
TRADE JOURNAL

Vol. 104 JUNE 19, 1958 No. 2175

Conditions of Purchase

In an ideal world, conditions of sale and conditions of purchase would be the same. They would respond perfectly to market conditions, when it swings to favour either the buyer or seller. Up to now, the position has been that most of the trade associations have issued their own conditions of sale, being actuated no doubt by the precept set by the railways and other transport authorities. Now the Purchasing Officers' Association has published a booklet, "Terms and Conditions of Purchase."* As any concern must sell more than it buys to remain in business, it can confidently be assumed that the sales departments of the various large firms represented in the membership of the Purchasing Officers' Association have scrutinized this document and given it their approbation.

The terms set out are thus sufficiently reasonable as to form a basis for the ideal—an agreed Conditions of Sale and Purchase Document. When dealing with the "care and return of patterns, dies, etc. (Clause 714), the foundry, whether it has made or bought a pattern, has not only to maintain it in good condition but also to hand it over to the buyer at his request. This assumes that a pattern is merely a physical entity, devoid of know-how and its use by a rival concern may carry advantages not envisaged by the buyer. Moreover, there is no reference to fair wear and tear, which must occur with even small runs on wood patterns. Here at least is a clause which requires further study before general acceptance.

The clauses which will worry both buyer and seller are those covering "Rejection" (Clause 10) and "Guarantee" (Clause 11). In the former, it is stated (ii) "The buyer shall, when giving notice of rejection, specify the reason therefore and shall thereafter return the rejected goods to the seller at the seller's risk and expense. In such cases, the seller shall within reasonable time replace such rejected goods with goods which are in all respects in accordance with the contract." This implies that the buyer is the sole arbiter as to whether the goods are or are not acceptable. This notion becomes more involved as a firm's inspectorate often has views quite different from—and more difficult to fulfil—than its buying department. Here surely there should be an arbitration clause for a really expensive item. It is satisfactory to note that the seller's liability is virtually restricted to replace a casting plus carriage. The trade associations are to be congratulated that they have put their ideas on paper, for, before their coming into being, reliance had to be placed on "Custom of the Trade." Now that the two documents exist, it should be possible for them to be reconciled with supplementary clauses to meet the needs of each individual trade.

* Published by the Association from Wardrobe Court, 146a, Queen Victoria Street, E.C.4., price 5s. post free.

Investment Founders' Technical Association

A new technical association serving the investment foundry industry using expendable pattern techniques for the production of industrial metal castings has been formed under the title of the British Investment Casters' Technical Association. The objective and scope of the organization are entirely devoted to technical aspects of investment casting and will include such activities as the preparation of specifications for materials and testing procedures, the improvement of production techniques, expansion of the application of investment castings, and the general exchange of technical information within the industry.

At the inaugural meeting held in London on June 11, which was attended by the representatives of 25 companies, the names of the founder member companies were announced as follow:—*Members:*—The Birmingham Small Arms Company, Limited; Close Tolerance Castings, Limited; Deritend Precision Castings, Limited; Firth-Vickers Stainless Steels, Limited; Hadfields, Limited; H. & F. Precise Castings, Limited; D. Napier & Sons, Limited, and P. I. Castings (Altrincham), Limited. *Associate members:*—Astor Boissellier & Lawrence, Limited; Chambers Bros., Limited; Claud Campbell & Company, Limited; W. J. Hooker, Limited; Monsanto Chemicals, Limited; Samuel Osborn & Company, Limited; Refractory Mouldings & Castings, Limited; Colin Stewart, Limited; Wilkins, Campbell & Company, Limited, and G. L. Willan, Limited.

Also elected at the meeting were the following as Members of the Council: Mr. D. H. Armitage, P. I. Castings (Altrincham), Limited (chairman); Mr. R. W. N. Danielsen, Deritend Precision Castings, Limited (vice-chairman); Mr. W. Foyers, H. & F. Precise Castings, Limited; Mr. G. A. Tomkinson, D. Napier & Son, Limited, and Mr. N. Walker, Hadfields, Limited. Through the courtesy of the British Steel Castings Research Association the address of the newly formed Association will be 5, East Bank Road, Sheffield, 2, and Mr. J. Bolton has been appointed secretary. It is to him that companies interested in membership should write for further particulars.

Cleveland Show Comment

Mr. J. R. Allan, B.SC., of Acme Conveyors, Limited, visited the Cleveland convention and exhibition, organized by the American Foundrymen's Society. In a private letter, he reports his impression that the exhibition was neither as large nor so interesting as the Düsseldorf show. The general depression in American business was not without its influence on the exhibition, yet there was an air of quiet confidence that things would soon return to normal.

The stand of Foundry Equipment, Limited, Leighton Buzzard, Bedford, caused a great deal of comment and aroused much interest at the show, with the Press and even on television. There were no fewer than 12,400 visitors during the run of the exhibition.

The authorities ran a daily paper, but the news this contained was of an ephemeral character. Mr. Allan did not find anything of a revolutionary character, but rather excellent examples of good foundry plant of the well-known types.

McKECHNIE BROTHERS OF BIRMINGHAM have acquired the assets of Progressive Welders and Warren Alloys, both of Canada. McKechnie Bros., already have subsidiaries in South Africa and New Zealand.

Shell-moulding Production in Japan

A film showing shell-moulding production methods in Japan was shown last month at Kendrick College, West Bromwich, by invitation of the Fordath Engineering Company, Limited. The firm, Toyo Kogyo Company, produce air-cooled cylinders and pistons and also many other automobile castings, such as camshafts, crankshafts, covers, etc. The film dealt with shell-moulding by the use of Plastsand*—the whole production procedure being completely mechanized. It showed that every stage of the manufacturing procedure is controlled, from the receipt of the sand, through every operational sequence to the completed shells and cores. In this way, uniform hot- and cold-strength of shells is maintained and any variation in investment procedure is recorded. Castings are produced on a continuous basis with composition checking of materials and test inspections being carried out on the same precision basis. It could be fairly stated that the film showed castings being produced by the shell-moulding process on an automatic basis, with the degree of control one would expect in a laboratory. The largest castings produced by the firm in small lots were 300-lb. each in weight. As one important viewer commented, one of the most striking impressions was that even in a country renowned for low labour costs, it was apparently sound policy to instal the very latest mechanized equipment and processes for achieving high quality production. It is obvious from the film that considerable capital outlay has been necessary but by the methods shown, it appears to be a most successful venture.

* Obtainable from the Fordath Engineering Company, Limited, West Bromwich, who hold a licence from the Acme Resin Corporation, USA, for the manufacture under their patents of shell-mould resins and resin-coated sands.

Birmingham University Post-graduate Course

Eight students have provisionally been accepted from 28 applicants for the post-graduate course on Foundry Science and Engineering, organized at Birmingham University.* For this course, five scholarships have already been donated, two by the Joint Iron Council, one by the British Steel Founders' Association, one by Birmingham University and one by the Department of Scientific and Industrial Research. It is reported that the calibre of the students applying is very high indeed, and it is hoped that finance can be made available so that all may be accepted. At present the danger exists that the course be taken by five students only, owing to the lack of scholarship support.

* For details see JOURNAL, January 9, p. 49.

Latest Foundry Statistics

Copper-base Castings: The British Bureau of Non-ferrous Metal Statistics in their June *Bulletin* reveal that the production of copper-base castings in April was 6,016 tons. The output for the first four months of the year is, at 25,246 tons, lower by 821 tons than that of 1957.

Steel Castings: The May *Bulletin*, issued jointly by the British Iron and Steel Federation and the Iron and Steel Board, reports that the average weekly production of steel castings during April was of the order of 5,700 tons. In March it was given provisionally as 6,300 tons, and in April, 1957, 5,600 tons. The output for the first three months of this year is lower by a weekly average of 200 tons as compared with 1957.

Influence of Vacuum Melting on Properties of Various Materials

*By W. F. Moore & A. J. Kiesler**

In the following Paper the Authors discuss what occurs in the vacuum furnace and what effect vacuum melting has on the mechanical properties of various materials. The study falls naturally into two sections in that there are two classes of materials in this connection—those which can be produced by conventional methods and those which, because of composition, must be vacuum melted. Their conclusion is that in cases where direct comparisons between air- and vacuum-melted materials have been made possible the latter reveal definite improvements in mechanical properties, and, probably, in corrosion-resistance and electrical properties.

In order to give as complete a picture as possible when describing properties of materials which have been vacuum melted or made in some other manner, it is necessary to go beyond one's own limited experience and to include the experience of others in the field. This is best done by literature surveys and personal contacts, and this, in fact, has been the method used in the preparation of this paper. However, even by these means a complete picture cannot be guaranteed because of the large amount of work which has been done, and is being done, which is of a confidential nature.

Since this Paper is for presentation to investment casters, it would have been appropriate to have concentrated on properties of as-cast materials. However, most of the work done until recently has been on wrought materials, and the bulk of available information on properties relates to these. Most of the information presented here deals with mechanical properties, though indications are that other important properties such as corrosion resistance and electrical characteristics, are also improved.

Materials

The properties of vacuum-induction melted materials can first be typified in two ways:—(1) Those which can be made by conventional methods as well as by vacuum-melting methods. In this case, the improvements can be attributed to the vacuum melting process *per se*. These materials may contain reactive elements in quantities which make melting in air a borderline process, or they may be more ordinary materials whose properties are sufficiently improved by vacuum melting to warrant the extra cost involved. (2) Those which must be vacuum melted because of composition. In this case, the improvements are largely due to new alloy compositions, containing fairly large quantities of reactive materials such as titanium, aluminium or zirconium, which can be made successfully only by the vacuum-melting process.

Advantages

What occurs in the vacuum furnace which leads the Authors to suspect that vacuum-melted material might have improved properties over material of the same composition melted in air? Fig. 1 shows some of the advantages which might be expected from vacuum melting. The oxygen and nitrogen of the atmosphere is removed from the presence of the molten bath, thus minimizing the occurrence of gas/metal reactions (formation of oxides and nitrides at the bath surface), which result in inclusions and slags. Reactions with gaseous reaction products can be driven more nearly to completion in a dynamic vacuum system (*i.e.*, a continuously-pumped system). This makes deoxidation by carbon or hydrogen attractive since the gaseous deoxidation products can be pumped away rather than separated by slags or entrapped in the metal.

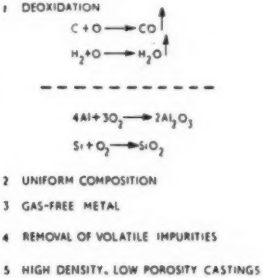
1 DEOXIDATION
C + O → CO
H2 + O → H2O
4Al + 3O2 → 2Al2O3
Si + O2 → SiO2
2 UNIFORM COMPOSITION
3 GAS-FREE METAL
4 REMOVAL OF VOLATILE IMPURITIES
5 HIGH DENSITY, LOW POROSITY CASTINGS

FIG. 1.—*Advantages of vacuum melting diagrammatically illustrated.*

Obviously, control of composition of reactive elements affected by nitriding or oxidizing reactions is simplified by removal of the oxygen and nitrogen in the atmospheres. Dissolved gases are removed in vacuum and lead to lower final gas-contents and to sounder castings. Volatile impurities such as lead, zinc, bismuth, cadmium, and tin are readily removed by evaporation from the melt.

For this presentation, materials will be placed in to the following categories:—(1) Materials for high-temperature application; (2) steels (*a*) stainless and (*b*) bearing and tool-steel types, and (3) pure metals.

High-temperature Alloys

Table 1 shows the nominal compositions of two high-temperature alloys—M252 and J-1570. The M252 alloy is one of the types that can be made either by vacuum melting or by conventional melting in air practice. Alloy J-1570 with over four per cent. titanium must be made by vacuum-

* Paper presented at the European Investment Casters' Conference at Stratford-on-Avon, May 19-23, 1957. The Authors are connected with the General Electric Research Laboratory, Schenectady, New York.

Influence of vacuum melting

melting techniques. Both of these alloys are used in the wrought condition. Fig. 2 compares average tensile strengths of vacuum- and air-melted M252 and stress/rupture properties of vacuum- and air-melted M252 and J-1570 alloys, over a range of temperatures. It is evident that vacuum melting of M252 produces a significantly stronger alloy, both in tensile and stress/rupture strength. It is also

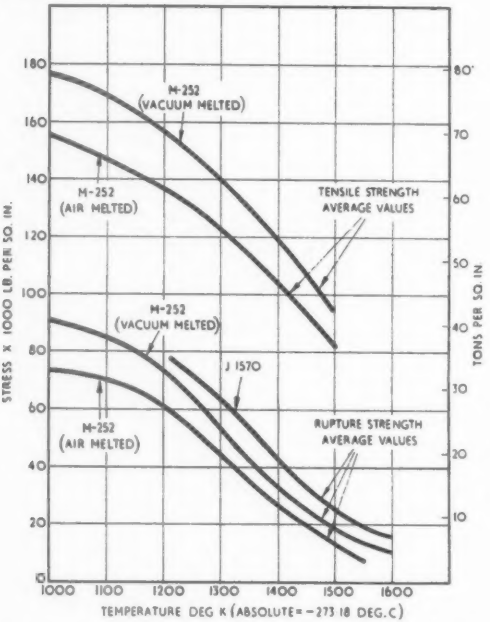
M-252 (VACUUM MELTED)
M-252 (AIR MELTED)
TENSILE STRENGTH AVERAGE VALUES
M-252 (VACUUM MELTED)
J 1570
M-252 (AIR MELTED)
RUPTURE STRENGTH AVERAGE VALUES
STRESS X 1000 LB. PER SQ. IN.
TONS PER SQ. IN
TEMPERATURE DEG K (ABSOLUTE = −273 18 DEG. C)

FIG. 2.—*Comparison between the average tensile strengths of vacuum- and air-melted M252, and stress/rupture properties of vacuum- and air-melted M252 and J1570 alloys.*

evident that J-1570 alloy which can only be made by vacuum-melting techniques is considerably better than even the vacuum-melted M252.

TABLE 1.—*Nominal Composition of Two Alloys.*

M-252		J-1570	
Element.	Per cent.	Element.	Per cent.
Fe	5.0 max.	Fe	2.5 max.
Cr	19.0	Cr	20.0
Co	10.0	Co	Bal.
Ni	Bal.	Ni	20.0
Mo	10.0	W	7.0
Ti	2.5	Ti	4.2
Al	1.0	C	0.20
C	0.15		
Mn	0.75		
Si	0.50		

Considering, now, the comparison of tensile ductility of air- and vacuum-melted M252, Fig. 3 indicates a fourfold improvement in the vacuum-melted over material melted in air. Fig. 4 shows

the considerable improvement in fatigue strength obtained by vacuum melting M252. It is interesting to note that while the nominal composition of M252

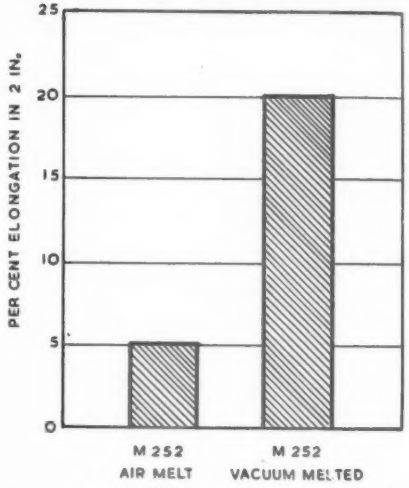

FIG. 3.—*Comparison of tensile ductility of air- and vacuum-melted M252, showing a four-fold improvement in the vacuum-melted material.*

contains quantities of Mn and Si, this material has been vacuum melted both with and without additions of Mn and Si. Although both of these

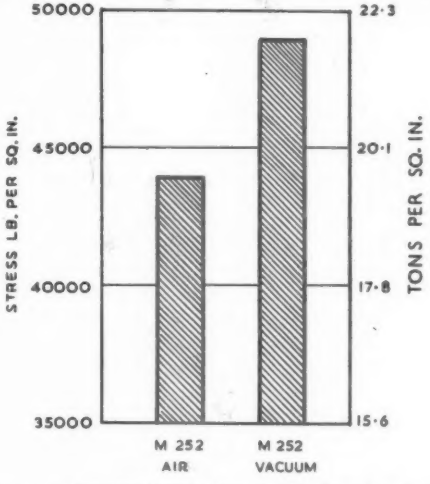

FIG. 4.—*Comparative fatigue strengths of air- and vacuum-melted M252.*

compositions are superior to material melted in air, the Mn- and Si-free material has much better ductility and workability than that containing Mn and Si.

Forgeability is also a property well worth considering in the evaluation of vacuum-melted *versus* conventionally-melted materials. The difficulty in cogging and rolling alloys, high in titanium and aluminium, is well known. It is generally agreed that this difficulty is caused by a metallurgically "dirty" product, and it appears that nitrogen is the primary cause. In vacuum melting, oxygen and nitrogen are not present in the furnace atmosphere (neglecting the outgassing of the charge) and, consequently, the ingots produced are clean. The workability of M252 as measured by ingot to bar-stock yield is increased by vacuum melting from 45 to 50 per cent. to about 65 to 70 per cent.

TABLE 2.—*Nominal Composition of "Waspalloy."*

Element.	Per cent.	Element.	Per cent.
Cr	19.5	Mn	1.0 max.
Co	13.5	Si	0.75 max.
Mo	4.25	S	0 03 max.
Ti	3.0	C	0.10 max.
Al	1.25	Ni	Bal.
Fe	2.0 max.		

Comparable results have been obtained by others in a variety of materials. H. R. Spendelow *et al* have compared air- and vacuum-melted Hastelloy R-235 which consists essentially of:—Cr 15 per cent., Fe 8 per cent., Mo 5.5 per cent., Ti 2.5 per cent., Al 2.0 per cent., C 0.15 per cent., and Bal Ni. Their conclusions were as follows: (1) The amount of inclusions (mainly oxides and nitrides) was drastically decreased and their degree of dispersion greatly increased; (2) forgeability was improved and the forging temperature range effectively increased without incurring hot shortness, and (3) stress/rupture strengths were generally improved and the S/R ductilities were markedly increased.

The effect of vacuum melting on ductility is graphically illustrated by these experimenters in Fig. 5, which shows a statistical distribution of values of S/R elongation at 815 deg. C. for air-melted and vacuum-melted Hastelloy Alloy R.235.

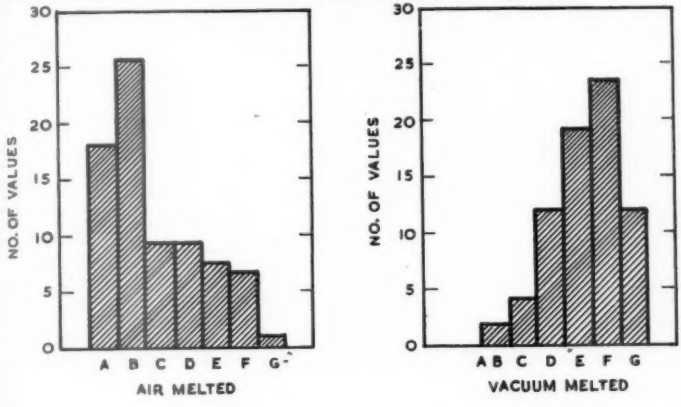

FIG. 5.—*Statistical distribution of values of S/R elongation at 815 deg. C. for air-melted and vacuum-melted Hastelloy Alloy R235. (See References (2).)*

F. N. Darmara has reported a threefold improvement in rupture life of Waspalloy, an alloy with the nominal composition shown in Table 2. This improvement is illustrated in Fig. 6 in which curve A represents 100 heats, melted in air curve B, 100 vacuum-melted heats and curve C, 40 heats made by a later improved vacuum-melting practice.

It should be emphasized that not only is it important that better properties can be obtained by vacuum melting, but an equally important fact is that consistency in obtaining properties is much improved over melting in air techniques. This consistency can be attributed to the ability to control reactions more closely and thus control composition and cleanliness to a high degree.

An example of this is an experiment performed on Udimet 500 which has the composition shown in Table 3 and is only made by vacuum melting. S/R bars machined from vacuum-melted, investment-cast buckets have very consistent results at 935 deg. C. and 11 tons per sq. in. of about 42 hours with a reduction of area of 18½ per cent. The same vacuum-melted material, remelted in a conventional induction furnace under a very carefully controlled argon cover, showed no loss in average life and only slightly less average reduction of area but the extremely good consistency from heat to heat was missing.

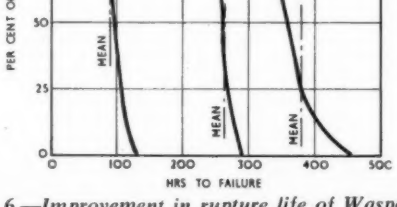

FIG. 6.—*Improvement in rupture life of Waspalloy (see Table 2), curve A showing 100 air-melted heats, curve B 100 vacuum-melted heats and curve C 40 heats made by a later improved vacuum-melting practice. (See References (3).)*

Influence of vacuum melting

Vacuum-melted Steels

The Authors have been discussing materials for high temperature application. A number of steels also undergo improvement in properties when vacuum melted. High-chromium alloys, like 430 and 446 ferritic stainless, which contain nominally 16 and 25 per cent. chromium respectively, normally exhibit brittle fracture at room temperature. Vacuum-melting techniques have permitted

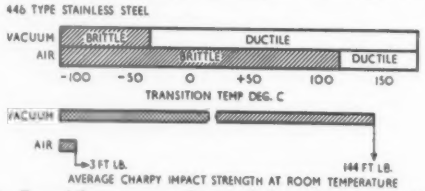

FIG. 7.—*Advantages obtained by vacuum melting* 430 *stainless steels.** (*See References* (4).)

production of these alloys with a substantially lower transition temperature and, consequently, a greatly improved room-temperature impact strength.

J. H. Moore has compared the properties of air-melted and vacuum-melted heats of these alloys. Figures 7 and 8 illustrate the advantages gained by vacuum melting these two alloys. The high-chromium 446 alloy shows an improvement of almost 50 to 1 in room-temperature impact strength.

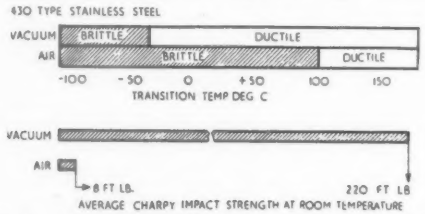

FIG. 8.—*Advantages obtained by vacuum melting* 446 *stainless steels.** (*See References* (4).)

Materials such as bearing steels and tool and die steels depend for their service life on properties such as surface finish, impact strength and fatigue strength. These properties, in turn, are closely related to the cleanliness of the metal or alloy.

TABLE 3.—*Nominal Composition of Udimet*-500.

Element.	Per cent.	Element.	Per cent.
Cr	17.5	Mn	0.75 max.
Co	16.5	Si	0.75 max.
Mo	4.0	Fe	4.0 max.
Al	3.0	S	0.015 Max.
Ti	3.0	Ni	Bal.
C	0.15 max.		

Examination of the microstructure indicates the reason for improvement of these materials—a great reduction in the number and size of inclusions. Commercial materials of this type are made with the expectation of getting inclusion counts according to the American Society for Testing Materials Jernkontoret chart of 2 to 3 for any or all types of inclusions. Vacuum-melted material is now being produced to a specification as follows: types A, B and C, with a severity rating of 1, and type D with a rating of 1½. All inclusions are of the light or thin variety and those that are found are usually smaller than the ones found melted in air material.

TABLE 4.—*Nominal Composition of Two Steels.*

4340		52100	
Element.	Per cent.	Element.	Per cent.
C	0.40	C	1.0
Mn	0.70	Mn	0.50
Si	0.28	Si	0.30
Ni	1.80	Cr	1.40
Cr	0.80	Fe	Bal.
Mo	0.25		
Fe	Bal.		

J. H. Moore has compared bearing surface life of vacuum-melted 52100 steel with that of melted in air 52100 and found a fourfold improvement due to vacuum melting. The rotating-beam test showed a much greater effect of fatigue life than the actual service test. These effects are illustrated in Fig. 9. Vacuum melting has produced 4340 steel with decreased anisotropy of fatigue properties as well as increased fatigue strength. Reverse-bend test results are shown in Fig. 10. The nominal compositions of 52100 and 4340 steel are shown in Table 4.

Copper and Nickel

Probably the most important of the pure metals

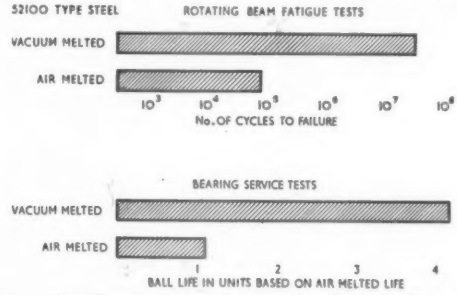

FIG. 9.—*Comparison between air-melted and vacuum-melted* 52100 *steel as revealed by rotating-beam fatigue tests and bearing service tests*†. (*See References* (4).)

to be benefited by vacuum melting are copper and nickel. Reduction of their dissolved gases greatly improves these materials for use in electronic-tube applications. The emission characteristics of cathodes made from vacuum-melted metals are superior because of high purity and closer composition control. Since it is not necessary to contaminate the copper with solid deoxidants, vacuum-melted copper exhibits electrical conductivity very close to 100 per cent. of the calculated theoretical value.

* Vacuum melting lowered the transition temperature of these ferritic stainless steels and this is reflected in greatly increased room-temperature impact strength.

† Vacuum-melting, it will be observed, has produced a material with increased fatigue strength reflected in increased ball life. Considerably fewer reject balls were produced in the vacuum-melting tests.

The Authors would like to have presented more specific data on properties of cast materials. This is a comparatively new field and most of the work done thus far has been of a confidential nature. The advantages inherent in the vacuum-melting process are the same, whether applied to materials which are cast to shape or to materials that must

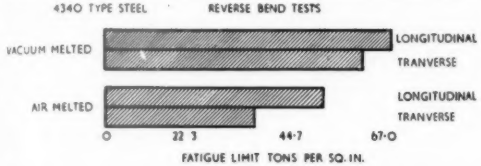

FIG. 10.—*Comparison between air- and vacuum-melted* 4340 *steel demonstrating how the latter process produces a material with decreased anisotrophy and increased fatigue strength.* (*See References* (4).)

ultimately be worked into their final form. It can be stated, however, that in the cases where direct comparisons between air and vacuum-melted cast materials are available, the improvements of vacuum-melted materials over materials melted in air are very substantial.

REFERENCES
[1] R. K. McKechnie, D. W. Green, W. F. Moore, "Some Observations on Vacuum Metallurgy." Electric Furnace Steel Conference, *Proceedings*, **12**, 1954.
[2] H. R. Spendelow, Jr., I. S. Servi, C. A. Fritzlen, "Vacuum Melting of High-Alloy Materials." Vacuum Metallurgy, Electrochemical Society Vacuum Metallurgy Symposium, October, 1954.
[3] F. N. Darmara and J. S. Huntington, "Experiences in Production Vacuum Melting of Nickel-Base Alloys." ASME Paper No. 55-A-198.
[4] J. H. Moore, "Promises and Problems Posed by Vacuum Melting." *Journal of Metals*, December, 1954.

Paints for Light Alloys

"Priming Paints for Light Alloys," a recent paper given to the Institute of Metals by Mr. J. G. Rigg, PH.D., and Mr. E. W. Skerrey, B.SC., A.I.M., as a joint contribution from the research laboratories of the Imperial Smelting Corporation, Limited, and of the British Aluminium Company, Limited, begins with the following synopsis:—

Results have already been published showing the resistance to corrosion of light alloy and mild-steel specimens with various primers and aluminium top coats, exposed for three-and-a-half years in rural, industrial, and marine atmospheres (*J.* Inst. of Metals, 1952-53, **81**, 481, 748). Further information can now be presented based on a continuation of the tests for a total of 10 years in a rural and a marine atmosphere.

Earlier indications are fully confirmed and at the end of the 10-year period, some of the paint systems on the light metals based on zinc chromate or zinc tetroxy-chromate primers require no more than cleaning or touching up. To a limited extent this is also true for the paint systems based on iron-oxide primers. Coatings based on red-lead primer have not proved so useful and, apart from one system at the rural site, complete replacement would be required to restore the respective finishes. Zinc chromate and zinc tetroxy-chromate primer systems are preferred for composite structures of steel and light alloys at all sites, while iron oxide would give reasonably satisfactory results for those at the milder rural site.

Atmospheric Pollution by Works Processes

The number of works registered under the Alkali, etc., Works Regulation Act, 1906, and the Alkali, etc., Works Orders, 1928-1950, at the end of 1957, states the Chief Inspector in his report on alkali, etc., works in England and Wales for that year (HMSO, price 5s.), was 872, involving the operation of 1,733 separate processes. Compared with 1956 there was a decrease of 17 in the number of works and 14 in the number of processes.

A number of complaints and requests for technical advice and assistance was received, relating both to registered and non-registered operations. Among the former, complaints were most numerous against cement works and fertilizer granulation plants. With regard to non-registered works, complaints against carbonizing works headed the list. The tendency towards concentration in the carbonization industry continues. An interesting trend in the gas industry is the continued progress in the installation of plants for the manufacture of gas entirely from oil. In addition, supply of oil refinery gas to gas undertakings has begun. Advice was given in seven cases relative to emissions from unregistered processes at gas and coke works.

Carbonization Industry's Emissions

In view of the department's future responsibility over emissions from the carbonization industry, it is felt that comment can best be deferred until the national position can be discussed. The department has been concerned with the giving of advice relative to minimization of emissions from proposed new units at existing iron and steel works and from proposed new works. As in the case of coke and gas production, the department is likely in future to have a major interest in the control of emissions from the iron and steel industry and it is again felt that comment can well be deferred until the national position can be reviewed.

The Chief Inspector's report on the Alkali, etc., Works Regulation (Scotland) Acts, 1906 and 1951, contained in the same publication, points out that at the end of 1957 the number of works registered under the Acts was 71, and the number of processes requiring inspection in these works was 101. These numbers represent decreases of nine and 13 respectively, compared with those of the previous year. On the whole, these decreases appeared to be a continuation of the present trend in industry to integrate manufacture into larger production units.

Belfast Firm Takes Over British Straddle Carrier Company

Short Bros. & Harland, Limited, Belfast, announces the acquisition of the British Straddle Carrier Company, Limited, formerly a subsidiary of Fison's Pest Control, Limited, and the only producer of straddle carriers in Britain. All manufacturing activities will be controlled by Short's general engineering division at Newtownards, near Belfast. Sales distribution and service will operate from East India House, Regent Street, London.

Preparation for the manufacture of the Mark II straddle carrier, designed to carry loads of up to 10 tons and 40-ft. long, is under way.

The board of the British Straddle Carrier Company, comprising directors and senior executives of Short Bros. & Harland, will be under the chairmanship of Rear Admiral Sir Matthew Slattery.

Equipment and Supplies

Electrically-heated Oven

An electrically-heated oven with horizontal forced air circulation has been announced by Hedin Limited, Commerce Estate, South Woodford, London, E.18. Because of its performance and construction, this oven can be used not only in industry, but also in laboratories (see Fig. 2). Normal temperature control is ± 1 per cent. of the operating temperature, up to either 200 deg. C. or 425 deg. C. as required, but straight line control is also available. Each unit is supplied with gear giving instant visual indication of operation, plus suitable electrical protection. The fan and motor, for instance, are interlocked with the heaters so that the latter cannot be switched on without the fans. The fans may, however, be run independently.

Forced air circulation is by means of a centrifugal fan, and is continuous throughout the oven and heating chambers. There are about 20 air changes per min. A butterfly valve to give controlled air circulation/recirculation is available, together with various other items such as a vertically lifting door and shelves or trays. A wide variety of sizes is available, both with vertical, as well as the horizontal airflow described. The range covers ovens of between 24 by 38 by 20 in. and 87 by 79 by 56 in., external dimensions (horizontal type) and from 38 by 24 by 20 in. to 103 by 63 by 56 in. (vertical type).

FIG. 2.—*Electrically-heated oven with forced air circulation for use in industry and research.*

Triple-compression Scrap Metal Baling Press

A new triple-compression hydraulic press, designed for Colvilles, Limited, for the baling of heavy grade scrap metal, has now been completed by Fielding & Platt, Limited, Gloucester. The new press (Fig. 1), which is completely self-contained and incorporates its own high-pressure pump system, supply tank, control valves and hydraulically operated hopper, can handle up to approximately 20 tons of scrap per hr. The scrap for baling is compressed in three stages, the initial compression being applied over the whole of the baler box area by a massive hinged cover applying a load of 270 tons. Secondary compression, of 360 tons, is brought about by the three rams and attached thrust face moving along the box axis inside the closed box. The final compression is carried out by a single ram, operating at right angles to the secondary, and applying a load of 480 tons.

On completion of the operation the ejection door is opened and the final pressing ram ejects the bale on to the pusher gear outside the baler box. Special steel cutting jaws are fitted to the baler box door to shear through overhanging scrap. The cutters are renewable and can be removed for sharpening when necessary. The hydraulic medium is supplied by a battery of Fielding type H.3 totally enclosed reciprocating pumps.

All movement of the baler is controlled from a console type desk, the selection of operating conditions being made by a handwheel selector. Indicator lamps and pressure gauges on the panel keep the operator informed of the motions of the press.

ROCKWELD, LIMITED, Commerce Way, Croydon, Surrey, have marketed their new "Type TT" welder's brush which combines several functions. It can be used for practically every type of welding set-up. Previously, two or more brushes were needed to cover every purpose. It also has other, more general, uses in industry—for example, cleaning corroded surfaces. The brush consists of a single wooden stock, with shaped handle in hard beechwood. On one side it is filled with 40 tufts of tempered upright steel bristles in three rows, and on the opposite with 39 tufts in three rows.

FIG. 1.—*New "Fielding" triple compression hydraulic press, designed and built for Colvilles, Limited, by Fielding & Platt, Limited, of Gloucester, for the baling of heavy grade scrap metal. The press, which can handle up to approximately 20 tons of scrap per hour, is shown here in the course of loading.*

Institute of British Foundrymen

Technical Sessions at the Buxton Conference

Extracts or synopses of all the papers presented at the recent annual conference of the Institute of British Foundrymen, held in Buxton, are recorded in what follows. In some cases, also, comment is included on the principal points arising during the discussions. Although this is necessarily brief and not a verbatim report, it is felt that it gives a good appreciation of the proceedings as a whole. In particular, it should give readers a general idea of the major themes exercising British foundrymen today and their reactions to current development work.

The writer attended session A of the technical sessions of the Institute of British Foundrymen conference in Buxton on Wednesday afternoon of conference week. At this, Mr. A. E. Peace presided over a meeting of about 70 members. The first paper to be presented was that on the "Purification of Cast Iron by Oxidation," by Mr. R. H. T. Dixon, A.C.T. (Birmingham) of the Mond Nickel Company, Limited. In it, the author described the operation and evaluated the effectiveness of three different types of process for the purification of pig-iron or synthetic cast irons by oxidation. The first process described, involved blowing a stream of oxygen on to the surface of molten iron with or without a lime-base slag. The second was concerned with bubbling oxygen gas through a molten-iron bath, whilst the third process made use of two different types of oxidizing slags. All the processes described were found to reduce the contents of some of the elements which are normally regarded as impurities in cast iron, without excessive loss of carbon. Elements removed or reduced included silicon, manganese, chromium, nickel, aluminium, titanium, and lead; sulphur and phosphorus were also much reduced by an oxidation treatment under basic conditions.

Initially, the author pointed out that it was cast iron that was dealt with, not pig-iron, which might be expected from the introduction, and his work dealt particularly with "synthetic" irons produced mainly from steel scrap, for purification of the metal for use with the magnesium process for s.-g. iron production. For example, he quoted metals where the absence of interfering elements, such as lead, titanium, arsenic, antimony, etc., was desirable, and if annealing qualities were required, low manganese and chromium contents were advantageous, whilst low phosphorus content was necessary for full shock resistance. These, of course, were in addition to low initial sulphur which conferred economy of magnesium addition. In the body of the paper, the author described three processes he had used: (*a*) impingement of a jet of oxygen on the surface of a ladle of molten metal; (*b*) bubbling oxygen through the metal, and (*c*) oxidation by slag—the aim being to reduce undesirable elements but not much to modify the composition otherwise. It was found possible by (*a*) to oxidize quite a number of elements, singly or simultaneously. Sulphur and phosphorus were also removed when lime slag was present, there was an attendant silicon loss but carbon was only affected after the other elements.

With process (*b*), silicon, manganese, lead and aluminium were reduced to very low levels after four minutes treatment, carbon went down from 3.66 to 3.42, this process was difficult to control. Process (*c*), using 10 per cent. slag and mixing with a perforated graphite disc plunger, manganese, titanium, sulphur and phosphorus were oxidized, but there was no temperature rise as was experienced with the oxygen-blowing techniques. In conclusion, the author listed the mechanical properties of the iron purified by oxidation and discussing results, stated that method (*a*) could be used successfully for treating cupola metal for chromium, lead and titanium removal, but the slag must be removed quickly; only tin has proved resistant to this treatment. Bubbling oxygen through the metal was also satisfactory but the detail of the method needed improvement; a submerged refractory lance would probably be better. This method was relatively simple to apply on a production basis, but fume-removal appliances were necessary. The slag method might prove to be the most economical method but it would have to be done in a heated vessel with a lining resistant to slag attack.

Discussion

Considerable well-informed discussion followed the presentation of this paper, the first speaker having the view that the paper might be misleading when considered in conjunction with ordinary foundry iron, because he believed that silicon would then be removed first in all the treatments. Top blowing, he said, was not a clean process and was possibly better suited for application as a pig-iron producing process. A disadvantage of such treatments was the production of bulky slags and the need for elaborate and costly fume-extraction plant which rather mitigated against adoption in small foundries. In asking how much oxygen was used, he quoted 200 to 400 cub. ft. per ton had been employed in similar experiments he had carried out. The author agreed with the body of these remarks and said he couldn't quote oxygen volumes for any but experimental results, except for manganese removal from steel where 200 cub. ft. per min. was employed.

Another speaker asked what was the iron loss during treatment and whether residual elements would be removed from high-phosphorus (1 to 1.5 per cent.) iron. To this, the author replied he had only worked with iron containing 0.15 per cent. phosphorus max. but thought that phosphorus could also be removed. Their own losses were 10

per cent. iron, but in reports of practical applications of the processes, 1 per cent. losses were quoted.

A malleable founder said the paper was somewhat reassuring to his fraternity! He said the processes sounded expensive and asked how arsenic could be removed. Here, considerable interchange of remarks took place, the author saying that on spectrographic analysis results, arsenic did appear to have been removed while the first contributor to the discussion stated he had never managed to remove this element. It was pointed out that the processes could be looked upon as an additional tool to pig-iron manufacturers and in this regard, malleable founders could benefit, for example, from chromium removal. Further remarks concerned surprise at the removal of nickel, copper and arsenic by the treatments, the author explaining that nickel went into the slag and suggested that it might be better for the founder to buy purified steel scrap. On this point, the author said ordinary steel always contained the undesirable impurities. As a final remark, the member opening the discussion said he had never experienced nickel and copper removal in his experiments.

Peeling in Malleable Iron

The second paper of the session, presented to an audience of about 40 members, was by Mr. C. T. Moore (British Cast Iron Research Association), on the "Cause of Peeling in Whiteheart Malleable Cast Iron." Here, the author explained initially that peeling was associated with high sulphur in the packing material in which castings were malleablized and high sulphur in the metal, which caused a separation or "peel" at the base of the decarburized layer of the castings. Increased silicon or silica manganese ratio increased the trouble. He went on to describe the experiments in studying the penetration of sulphide in an excess-sulphur whiteheart iron, and also described decarburization experiments performed in dry and moist CO/CO_2 atmospheres containing sulphur dioxide. The results showed that in dry atmospheres, provided they were only decarburizing and not oxidizing to iron, the amount and depth of sulphide penetration was greater with higher CO_2 contents. Traces of moisture in the gases were found to reduce sulphide penetration in high CO_2 atmospheres because of oxidation of the iron surface, and to increase it in low CO_2 atmospheres, because of an increase in decarburization under conditions where only sulphide was formed in the surface scale. From the results obtained, a hypothesis has been suggested to account for the disagreement between previous investigators (for example, Bernstein, Priest and Irvine's work), on the effect of CO_2 content in gaseous atmospheres containing sulphur dioxide on sulphide penetration.

Mr. Moore ended by saying that, of the earlier work, Bernstein's was the more relevant conclusion in practice; it entailed that oxidation should be kept at a minimum during the annealing.

Discussion

Malleable founders, of course, monopolized the discussion, first saying that with good ore, peeling was no problem, but with the decreasing availability of UK ore for annealing, the author's paper would assume greater importance, as it would also with the swing to oil-fired semi-continuous annealing furnaces, which was following the application of the Clean Air Act. The author agreed to this view and stressed that in oil-fired annealing, the sulphur contribution from the oil was continuous throughout the process. A question was asked about the war-time idea of using limestone as an adulterant to ores, but the author feared there would be trouble with ore adhesion to the casting. It was explained, however, that practical experience indicated that the limestone process worked reasonably well, but if too much lime was incorporated in the packing material, only a thin decarburized skin resulted in the casting. The main trouble with using lime was the dust nuisance of the lime chips going to powder. In reply to a question on the application of his findings to high silicon and high manganese/sulphur ratio iron, the author replied he had seen that sulphide penetration always did seem tied with the presence of a silicate phase. With excess sulphur in the metal, there would be more sulphide; with excess manganese, some sulphur would be taken up by the manganese. He would expect peeling to be worse when running with 0.7 to 0.8 silicon in the casting. Another speaker from the BCIRA summed up the position by saying that the answer to these latter queries was given in published literature, particularly in Bernstein's work, the depth of penetration of the sulphide layer increased with increases in silicon; with balanced silicon and manganese, or excess manganese, then peeling could be inhibited even when using sulphurous ores.

Design of Heat Exchangers

Concluding the session, Mr. E. Longden, M.I.MECH.E., past-president of the Institute, gave a paper on Heat Exchangers, stressing that his designs put forward for consideration were purely hypothetical and for application to small cupolas. Hitherto, he explained, the UK has lagged behind Continental designers in hot-blast cupola adoption, whereby cheaper metal was produced through the use of more scrap in the cupola charge. The recuperator type of heat exchanger had gained ground also on the basis of fuel saving and irrespective of metal loss. The author made no attempt to develop the theory of hot-blast application or the laws governing heat transfer in heat exchangers beyond a few well-known generalities, stating that the success of a heat-exchanger design would probably depend more on the mechanical considerations than on 100 per cent. heat-transfer efficiency. He put forward two suggested designs of exchangers with the idea of increasing interest in the search for new and possibly more flexible types of equipment. At the conclusion of the paper, Mr. Longden went on to review briefly, and illustrate, about a dozen different types of blast-heater units developed over the last 40 years for converting cupolas to hot blast.

Discussion

The first speaker criticized the author's designs from the operational control point of view and said this criticism applied also to a great number of the other types he had illustrated. To-day's development had been in three directions; to provide an

efficient exchanger, resulting in low maintenance and good control. The author replied that ignoring his idea of using metal balls as a heat exchanger, his other system would seem to be simple and of relatively cheap construction; maintenance and power consumption ought to be low for blast in the region of 250 to 300 deg. C. The second speaker said he would be loth to operate the author's second design, for one reason because of air losses which would prevent proper control. Continental designs of recuperator had proved satisfactory and increased scrap utilization was not the sole advantage—even if scrap prices went up, he would still like to use hot-blast cupolas. In his view, cupolas with independent blast-heaters would seem to be as expensive to run as cold-blast cupolas. Another speaker compared Continental with US systems of cupola blast-heating, and said the latter avoided high temperature blast troubles and the Americans didn't need high-carbon pick-up in their irons. On the other hand, Continental operators wanted maximum metal temperature with maximum coke economy. Another speaker said the Cowper-stove type of blast-heater had proved efficient for blast-furnace use and would seem to have possibilities for cupola operation. In a similar vein, the final contributor to the discussion said founders were too parochial in their outlook and they should study heat exchangers used in the steel industry, for example, to get new ideas.

Thursday Morning

Resuming attendance at the technical sessions on Thursday morning, the writer attended session C (in the Playhouse), also under the chairmanship of Mr. A. E. Peace; the first paper being "Production of Foundry Sands" by Mr. A. R. Abraham, M.A., J.P. (director of the Mansfield Standard Sand Company, Limited). About 80 to 90 were present to hear the author's masterly survey of the sand-producing industry in relation to the foundry consumer, embodying an historical background of the material and covering the problems and difficulties met with in locating, winning and processing the deposits. The latter were dealt with separately under (*a*) plain silica sands used in formulating synthetic moulding sands, and in coremaking and (*b*) the naturally bonded sands. The review covered five major points, which it was thought would specially interest those operating small foundries, *viz.* (1) Development of the foundry industry which the sand producer must serve; (2) resources available; (3) control by which it was possible to provide sands of regular consistency; (4) advancement in technical application by the producer, and (5) development of modified naturally-bonded sands in a wider range, which would prove useful both in maintaining standards and for individual application where such material was used.

Introducing the paper, Mr. Abraham said that geologically speaking, UK sands were comparatively "young," *i.e.*, only about 300-million years old, and produced a table showing the geological time-table of sand formation (see Table 1).

He went on to show the location of high-silicon sands in the UK and the systems they belonged to

TABLE 1.—*Geological Derivation of Foundry Sands.*

Age in millions of years.	Geological systems.	Development period in millions of years.
2,000	*Pre-cambrian era*	—
360	*Primary era*	—
	Silurian	
	Devonian	
	Carboniferous (millstone grits and rotten rocks)	
	Permian (Permian yellow sands)	
155	*Secondary era*	
	Triassic system (Bunter sands)	35
	Jurassic system	35
	Cretaceous (lower green sands)	65
55	*Tertiary era*	
	Paleogene system (sands in Hampshire)	35
	East Kent and	20
	Neogene (North Yorkshire)	¼
	Quaternary era	

and produced a similar map for the occurrence of naturally-bonded sands. Tabular matter was used to record both the various approximate gradings of plain silica sands from 14 sources and for naturally-bonded sands which came from 17 locations. A most important section at the end of the paper dealt with the blending of sands to give a specific range of properties demanded by founders. Here, the aim had been to give mixtures each having a different permeability range but similar compression strength when tested at a moisture of 6 per cent., and the author showed two graphs illustrating the results possible from the sand-blending experiments. These indicated that permeability/moisture curves could be obtained for the sands chosen, each representing the maximum and minimum values for the sands as-mixed. The limits were obtained as a result of the blending experiments and showed that at 6 per cent. moisture, it was possible to obtain four mixtures with a choice of permeabilities ranging from (*a*) 40 to 50; (*b*) 50 to 65; (*c*) 65 to 80, and (*d*) 80 to 95. The second graph of green-strength/moisture showed that at 6 per cent. moisture, each of the four sands had a green compression strength as-mixed, between 4 and 5 lb. per sq. in. When each of these sands received 10 min. milling, the green strength increased to between 8 and 9 lb. per sq. in. at the standard moisture and it was found that the permeabilities were not substantially affected. Apart from having individual applications, it was put forward that each mixture might have a distinct sphere of usefulness in restoring a deteriorating sand system to a required level. For example, this could require the injection of a sand of higher permeability for a definite period from time to time, in conjunction with the normal sands being used. The true value of a sand in terms of casting surface finish, low scrap and reduced fettling-shop work, could often be improved by these means.

Discussion

This matter of blending sands for supply to founders was taken up immediately in the discussion and the author elaborated on his remarks in this connection. Such topics as advice to founders as to which were the best sands for particular purposes, the need for balancing core and moulding

sands entering the same system, day-to-day control at quarries were mentioned in this connection, the author stating categorically that suppliers can now produce naturally-bonding sands of varying strengths to suit the demand. As to the supply of dried sand to founders instead of founders each drying their own, the author said this service could be provided if customers really wanted it, though there were problems of cost and transport. The latter could be solved by packing in bags or delivery by tank-type wagons, just as cement is delivered in bulk nowadays.

Mould Production Systems

The second paper of the morning's session was a really practical paper by Mr. H. Pinchin (manager, Erewash Foundry of Stanton Ironworks Company, Limited), on his experiences in making moulds in a mechanized foundry. The particular features dealt with were mould-production systems involving (*a*) the major use of green sand; (*b*) examples of core support without the use of chaplets, and (*c*) the control of the sand stream when using impeller-type ramming machines. The author related experiences in ramming green sand by slinger and instances where careful design of tackle and the maintenance of ramming equipment had played a prominent part in the production of uniform moulds. Special individual core-grids had been developed, he said, for such castings as pipe-specials which had permitted green-sand cores of appreciable size to be used, completely unsupported. Describing the sand-reconditioning plant which serves the whole of the Erewash Foundry, Mr. Pinchin had found it of prime importance to maintain a permeability of the order of AFS No. 100, when using naturally-bonded sands. Every stage of the paper was illustrated by a wealth of practical examples and at its conclusion, a film was shown of the methods in use.

Discussion

The discussion which followed the presentation of the paper was mainly of a congratulatory nature, it being evident that the contribution had considerable obvious applications in the works of individual members. In reply to a question on sand reconditioning, the author elaborated his earlier remark by saying that, with sand, it was impossible to "live on capital," *i.e.* there must be some new sand entering the system all the time, otherwise the base sand became "brittle." Another contributor said that it was helpful to add clay as a slurry. Yet another speaker said that the author's exposition of slinger practice and his "do's" and "don'ts" were really excellent and that other founders operating this equipment should regard Mr. Pinchin's work as a manual of good practice. To this speaker's query as to what use was made of the shatter-index value of sand as applied to slinging practice, Mr. Pinchin said that shatter values were not used, strength and permeability ratios only being considered.

(Here, the Chairman had to close discussion on this paper, owing to time limit being exceeded).

Maintenance of Plant

The final paper of the morning session, "Maintenance of Foundry Plant and Equipment," was given by Mr. J. I. Blackbourn (chief works maintenance engineer, Stanton Ironworks Company, Limited). Initially, after defining the terms "maintenance" and "plant and equipment," the author divided the causes of maintenance into five general groups under the headings (*a*) fair wear and tear; (*b*) neglect; (*c*) faulty operation; (*d*) premature failure, and (*e*) accidental damage. Amplifying these causes, he went on to show that those under (*a*) could be dealt with by planned maintenance, those under (*b*) and (*c*) could be, to some extent, intelligently anticipated, while those listed under (*d*) and (*e*) being of a sudden and unexpected nature, could only be dealt with as they arose. With the objective of avoiding all interruptions to production in the most economical manner, he showed the desirability of dividing his work into four categories: (1) routine regular inspections and preventive maintenance work; (2) periodic major overhauls; (3) preparation of spares, and (4) breakdowns or emergencies. Examples of the way in which different types of work are dealt with at Stanton were given to illustrate the points made. Amongst these, the author described lubrication as the "nigger in the woodpile" where neglect was the causation: other contributory factors being failure to keep machinery clean and its faulty operation. Premature failure and accidental damage could not be anticipated, of course, except by duplication of vital equipment and here, he stressed the value of routine inspections and mentioned the idea of providing a folder for maintenance analysis by the foreman and any records of work put in hand. Chain-sling maintenance throughout the works, Mr. Blackbourn said, was arranged through a card-index system with devices to indicate when annealing or other maintenance was due. In conclusion, the author discussed the control of the cost of maintenance and stressed the importance of really effective co-operation between the production and maintenance personnel of an organization, and mentioning as a last word the value of "good housekeeping."

Discussion

A quite brisk discussion ensued, much of it on the pro's and con's of providing incentives for maintenance workers. The first speaker asked if such a scheme could be suggested to keep maintenance men in step with production personnel and whether lubrication should be the responsibility of operators or maintenance staff. The author replied that he did not like incentives, but did operate a quite elaborate bonus system. A danger was the possibility of a maintenance job being skimped to get a machine back at work; he would like lubrication all done by his own men. Wherever a bonus system or incentives were applied, the responsibility of the staff to avoid slipshod work was increased. Replying to a suggestion that the number of boxes made could be used as an index

of foundry productivity and applied to maintenance workers, Mr. Blackbourn replied that this was not easy in a multiple organization. As to control of capital laid up in spare parts, the reply was that centralized spare-part control for a large undertaking pays good dividends; with the present improved delivery position, it was a policy to try to get makers of equipment to "carry" spares. Where maintenance men were allocated to a given piece of plant, Mr. Blackbourn thought it should still be the maintenance engineer and not the foundry manager who should control those men. As to whether replacement of wearing parts should be arranged on a time basis, scaled according to the known "life" of that part, the author replied that at his works replacements were only made when the inspector said it was necessary, but inspections of such plant were carried out at definite intervals. Finally, in considering whether parts should be returned to the suppliers or maintained on a firm's premises, Mr. Blackbourn pronounced himself very firmly in favour of sending specialist equipment back to the specialists for maintenance.

Pressure Moulding

The final session attended by the writer was session E in the Playhouse Theatre on Thursday afternoon, with Mr. C. H. Wilson, senior vice-president, in the chair. The first paper given was the exchange contribution, sponsored by the American Foundrymen's Society, the subject being "Pressure or Diaphragm Moulding," by Mr. T. Barlow, who is sales manager of the Eastern Clay Products Department, International Minerals and Chemical Corporation, Chicago. As Mr. Barlow could not come over to present the paper in person, it was read for him by Mr. J. Hill, who first explained that he had never seen this process carried out, although he had been in close touch with the author and several of his colleagues had seen machines in operation which had been built to use this system of mould making.*

It appeared that the successful practice of pressure moulding (in America) depends on two factors (1) the use of a sand of high strength and high flowability and (2) the employment of a diaphragm to apply high pressure air to the whole of the sand area when producing moulds on machines. This results in a mould of high overall density, claimed to be free from packing variations normally to be associated with jolt/squeeze mould making. From such a mould of hard and uniform texture, castings of quite a good degree of precision could be expected. Details were given in the paper of the equipment needed to work these conditions and examples of typical layouts were quoted. Apparently, the time of operating the process is almost dependent on the size of the mould, so that use of large boxes with a number of patterns in each box would seem to be advantageous. The paper concluded with notes on the field of application of this system of mould making.

Discussion

To make the discussion more informative, the chairman at the outset and with Mr. Hill's approval, asked for any members in the audience who had personal experience of diaphragm moulding to amplify Mr. Hill's replies and he also said that written discussion could be recorded for transmission to the author. The first speaker, himself a sand "expert," thought that high flowability of sand was really an essential of the process and asked if close grading of rounded-grain types of sand were recommended. Could the CO_2 Process be applied directly after diaphragm squeezing, he asked. Mr. Hill agreed with his conception of sand requirements, but said that existing sand-preparation and reconditioning plants would seem to be able to cope. Another speaker thought that the high hardness of mould surfaces produced in this way ought to be resistant to metal penetration, but was doubtful if the full hardness would in fact be secured in very deep pockets of moulds. Here, he said better results might be expected from jolt. High mould hardness, he said, might result in "tearing" with some steel castings. This and several other questions Mr. Hill left for the author to reply by correspondence. Amongst the points raised were such matters as the purpose of the special sand additive mentioned in the paper, the alternative use of an air cushion under the head of an ordinary squeeze-type moulding machine, how much taper was necessary on deep cods (here, Mr. Hill stressed that no undercut could ever be tolerated); and how could feeder heads and downgates be incorporated?

Shell, Shaw and CO_2 Processes

The final paper of the session was an account of a new foundry which had been set up for the manufacture of small steel and alloy castings by shell, Shaw and CO_2 moulding techniques. It was read by Mr. J. H. Osborn, who had been assisted in its compilation by Mr. T. A. Marsden and Mr. R. F. Horton, all three being associated with Samuel Osborn & Company, Limited. The paper concerned the processes developed in this firm's new foundry at Eckington, near Sheffield,* and outlined the layout and construction of the factory and described, in detail, the various manufacturing processes carried out. New techniques and plant have been found necessary for the successful operation of these processes, and, for these, the foundry had been made essentially a highly specialized jobbing foundry, producing many grades of carbon and alloy steels. A major portion of the output from shell moulds is in stainless- or heat-resisting steels, but applications of the Osborn/Shaw and CO_2 Process was indicated in the paper.

Particular attention has been paid at Eckington to metallurgical control and heat-treatment facilities, and concerted effort has been made to comply with the latest conditions of the Factory Act and the 1953 Iron and Steel Foundry Regulations. Eckington works, from the outset, has been entirely independent of the firm's steel foundry in Sheffield

* An illustrated description of diaphragm moulding as operated in two French foundries is shortly to be printed in this JOURNAL.

* An extended account of types of casting production undertaken at this foundry is shortly to be printed in this JOURNAL.

operating conventional sand-moulding techniques. At the same time, allowance has been made for the fact that processes necessary for the manufacture of high-quality small castings may change in the next decade. At the conclusion of a quite long summary of the paper given at the meeting, Mr. Osborn showed a large number of coloured slides of the foundry and processes operated there and also screened a film amplifying the detail. Those attending this session of the conference agreed that this was one of the best presentations of papers made for a very long time.

Discussion

In opening their remarks, most speakers in the discussion emphasized their appreciation of the subject matter and the way it was put over. In reply to the first question on how the authors obviated the "orange-peel" effect when shell moulding low-carbon steels, Mr. Osborn said there was no single reply possible, much depended on section thickness of the component and the way the "biscuit" was prepared. Replying to another speaker, he thought the absence of hot-tears was due to the good collapsibility of moulds and cores. On the subject of patternmaking for such small quantities as fifty-off produced in small moulds, it was explained that patterns for these amounts were of the same high-precision and material as for larger quantities, but the company always hoped the first fifty would lead to really economical quantities; many orders were accepted on a trial basis. Mr. Marsden was asked how he kept slag out of the castings being poured from h.-f. melted metal and replied that zircon/bentonite ladle linings (and tea-pot spouts) were employed and the metal in the furnace was taken 100 deg. C. above casting temperature and allowed to stand for three minutes before slagging. Another speaker suggested that olivine sand for shell moulds eliminated "orange-peeling" but asked how carbon pick-up was avoided when casting low-carbon stainless alloys in shell moulds. Mr. Osborn said they did not use olivine sand and had no trouble with carbon pick-up. The final remarks in the discussion included an explanation of "orange-peel" effect by a shell-moulding expert and a query as to possible trouble arising from closing of shell halves at unequal temperatures. To the latter, Mr. Marsden replied they only used hot shells for closing (at about 100 deg. C.) and no trouble was experienced. If any risk of inaccuracy was involved, they would close cold-to-cold shells.

Obviously the writer was unable to attend all the sessions and synopses of the papers given are recorded in what follows.

Session B, Chairman: Mr. J. Blakiston

"Surface Finish for Non-ferrous Castings"—Report of Sub-committee T.S.48 of the Technical Council.

This was the first report of sub-committee T.S.48 of the Technical Council and described an investigation into the influence of numerous metal and mould variables on the surface finish of non-ferrous castings. The experimental technique consisted of having a series of test castings and assessing the surface finish quantitatively against a set of chosen standards by touch. The results showed clearly the predominant influence of the fineness of the sand and its degree of ramming. Also, relations between the surface finish of both light-alloy and copper-base castings and the AFS fineness number, and the permeability of the sand have been established. Examination of moulds produced by various production techniques showed clearly a marked variation in the surface density of the moulds with a consequent considerable variation in surface finish. In agreement with previous work, the results showed clearly the considerable influence of hydrostatic head in determining the surface finish and incidence of metal penetration. Further, the experiments showed that various mould and core dressings, based upon graphite and various refractory minerals, could virtually nullify the influence of metal head and lead to a substantial improvement in surface finish. It was pointed out that, in contrast to popular belief, mould additions appeared to have little influence on finish, at least with the test casting used in this investigation. Certain mould and core binders were shown to have a beneficial influence on finish, especially shell moulding and CO_2 binders. To a certain extent, the report pointed out, the influence of binders on finish is a reflection of their influence on the flowability of the sand. Other variables that influenced surface finish were alloy type, the extent to which the sand had been used, and pouring temperature, whereas pattern quality, venting and green *versus* dry sand had no significant effect. Finally in this report, a simple and reliable method of producing standards of surface was described.

"Influence of pH Variation in Foundry Moulding Materials on the Surface Finish of Steel Castings," by D. H. Houseman, M.A., Ph.D. (department of refractories technology, University of Sheffield).

In this paper, a technique for pH measurement, suitable for routine laboratory use on foundry moulding sands was developed. Examination of incoming raw materials and of production mixes showed wide variation in pH characteristics, so that quality-control routines could not be established. Methods were then developed for establishing pH control at any level and in any sand mix quickly and cheaply; control at various pH levels in the range of 5 to 11 did not generally change the normally measured sand-strength characteristics to any marked extent, though in some instances, it was found that dry strength could be improved without any significant loss in green strength. In an attempt to assess the influence of pH modification of sand mixes on surface finish, about 150 castings were made during 12 trials under reasonably well-controlled conditions and covering representative casting weights (up to 300 lb.) and metal compositions. Four different sand mixes were used and pH was varied in the range 5 to 10.5. None of these trials indicated that any improvement in the quality of surface finish was to be had from the pH changes made.

"Investigation of the Flow of Foundry Alloys with Various Gating Systems used in Sand Moulding," by Mr. Jeancolas (head of sand moulding research division, Centre Technique des Industries de la Fonderie).

This was the officially sponsored paper from the *Association Technique de Fonderie.* In connection with research carried out by the *Centre Technique des Industries de la Fonderie,* the author recalled in this paper the theoretical and practical investigations undertaken in recent years by Trenckle, in which it was shown in published results that the study of the flow of ferrous metals in sand moulds was subject to the laws of hydraulics. Following an outline of a few theoretical and practical considerations justifying the choice of the gating systems employed in the flow tests at present being carried out in the laboratories of the *Centre Technique,* the author detailed the initial results of these, making it possible to show to what extent these same laws were actually applicable to the study of the flow of others alloys. Various gating systems described as "under pressure" or "under reduced pressure" were studied comparatively, from the point of view of matching the flow of metal with the gating system, and the results were also given relating, on the one hand, to the effect of temperature, and on the other, to the effect of the nature of the alloys on the distribution of such flow. It was concluded that the systems "under pressure" gave the best results from the point of view of matching flow and gating systems, and that it was reasonable to treat the study of the gating systems usually used in sand moulding as if the metal that passed through them was water at ordinary temperatures, at least so far as concerned the majority of the alloys nowadays prepared in the foundry and cast at a proper temperature.

Under the chairmanship of Mr. C. H. Wilson, the following three papers were presented in session D, which was held in the Restaurant Annexe.

"Intermediate Metal Thermocouple in Metal/Mould Interface Temperature Measurements," by Dr. D. V. Atterton, M.A., and Dr. D. H. Houseman, M.A. (Dr. Atterton is technical director of Foundry Services (International), Limited, and Dr. Houseman is in the department of refractories technology, University of Sheffield).

This paper described the application of an intermediate metal thermocouple for the determination of the metal/mould interface temperature of steel castings. Previous results, using sheathed thermocouples had suggested, surprisingly, that the maximum interface temperature was well below the liquidus temperature of the steel. Results obtained with intermediate metal thermocouples showed that molten metal existed at the metal/mould interface for substantial periods of time with maximum temperatures some 20 to 50 deg. C. above the liquidus temperature of the steel. Results also indicated that initial chilling and solidification of the first metal to enter the mould may occur, but that, with normal superheats, this chilled layer was soon remelted.

"Instrumentation for the Melting of Non-ferrous Metals," by Mr. D. W. Brown, B.Sc., F.I.M. (Morgan Crucible Company, Limited).

Initially, the author pointed out that most non-ferrous foundries have few instruments for controlling the melting process. In this paper, he reviewed the instruments which should be employed and discussed their application. The paper covered fuel supplies, combustion, degassing and pyrometry, and mentioned briefly some of the more complex instruments which might be employed by the laboratory of a large foundry. Pyrometry was discussed in detail and the practical difficulties dealt with.

"Use of Stearin Wax for Stimulating Shrinkage Defects in Steel Castings," by Mr. D. B. James, B.Sc., and Mr. J. M. Middleton, A.Met. (Both the authors are with the British Steel Castings Research Association, Mr. James being a senior investigator and Mr. Middleton the head of the foundry processes section.)

Provided that the pouring temperature did not exceed 2 deg. C. superheat, the freezing of pure stearin wax could give a useful guide to the distribution of shrinkage in plain carbon steels containing 0.2 to 0.3 per cent. C. Since the solidification shrinkage of stearin wax was greater than steel, the analogy cannot be taken too far, *e.g.,* castings fed to soundness in wax would be over-risered when made in steel. It was difficult to keep the temperature in a large volume of molten wax within 2 deg. C of the melting point, and for this reason also, the successful use of the simulation technique was limited to quite small castings.

Mr. G. R. Shotton was chairman at session F, and synopses of the three papers presented follow.

"Non-ferrous Melt Quality Tests"—Interim report of Sub-committee T.S.45 of the Technical Council.

The interim report on the work of sub-committee T.S.45 had been prepared for presentation with the object of focussing attention on the problem of quality-control tests for molten non-ferrous alloys before casting. The sub-committee had been exploring the possibilities of suitable tests over a period of five years and this lengthy period indicated the difficulty and diversity of the problem. A considerable amount of time was initially spent in thoroughly investigating the AFS fracture test, but finally it was discarded as unsuitable. Further tests were done on vertically-cast DTD-type and sprue-type bars for observation of head setting and density determination. Other tests investigated were constant-volume density determination, rapid density determination, determination by "gravitometer" and a ladle-setting test, all tests mainly designed to show gas content. In the light-alloy field, the reduced-pressure solidification and gas determination by means of the Ransley apparatus have been investigated. In addition, a fluidity test for both copper-base and light alloys had been considered. More recently, the possibility of ultrasonic testing had been considered and whilst this was promising in certain directions, there were inherent difficulties in its application to copper-base alloys.

A questionnaire has been sent to non-ferrous

Institute of British Foundrymen

foundries throughout the country with the object of clarifying faults due to metal, and to disclose also to what extent precasting quality-control might already be in use, and the tests that had been found suitable. The replies to the questionnaire confirmed the sub-committee's original view that the presence of gas was a major factor and was responsible for most trouble in both copper-base and light-alloy foundries. The questionnaire also confirmed the view that very little systematic precasting quality checking had been or was being applied. Quality-control tests were rarely carried out in copper-base non-ferrous foundries, with the exception of foundries where special alloys, such as high-tensile brass, nickel alloys, or aluminium bronze were cast. Precasting tests were more common in the light-alloy foundries, particularly for gas and "modification" checks.

The general conclusion was that a high gas-content was the greatest single cause of trouble attributable to the metal in both copper-base and light-alloy foundries and steps should be taken to check the amount and adjust it to a safe level.

"Influence of Sulphur on the Castability, Tensile Properties and Pressure Tightness of Sand-cast Bronzes and Gunmetals," by Mr. H. Reiter, B.Sc. (Connected with the British Non-ferrous Metals Research Organization).

The maximum sulphur content in cast bronzes and gunmetals, although not listed in BSI specifications, is fixed by certain users at an arbitrary value which may be unnecessarily low. Elementary sulphur was added to 85-5-5-5 and 88-10-2 gunmetals and 90-10 phosphor bronze from which DTD bars, discs with inadequately fed bosses, and fluidity and castability test-castings were cast in green-sand moulds. A metal mould was used for comparing hot-tearing characteristics. The results of this work showed that sulphur contents up to 0.3 per cent. had no deleterious effect on porosity, grain structure, tensile strength and pressure tightness, or on the other properties examined.

"Some Expansion Phenomena Associated with the Freezing of Non-ferrous Alloys," by Mr. W. B. Hendry, B.Sc., and Mr. S. N. Wrightson, B.Sc. (The authors are lecturers of the National Foundry College).

A series of experiments was designed to study the influence of mould material upon the type and size of shrinkage defect occurring in copper-base and light-alloy castings. These experiments have shown that a significant expansion occurs of the solid envelope throughout the period of solidification. It is shown in the paper, that this expansion is controlled by the hardness of the mould material and that it bears a direct relationship to the size of the final shrinkage cavity. The degree of expansion is affected by the nature of the alloy, and appears to be closely linked to its gas content and/or to the partial pressure accruing from its composition.

Foxboro-Yoxall's New Factory

The new factory of Foxboro-Yoxall, Limited, which was officially opened on May 22, is built on a 58-acre site just to the north of Redhill. It lies between the two railway lines which converge at Redhill, and just off the main London/Brighton road. The buildings at present comprise an office block, the factory itself, a power house and a restaurant. All have been sited and planned for subsequent expansion to meet new demands for industrial instruments.

The factory occupies 85,000 sq. ft. and lies immediately behind the office block to which it is connected by covered ways. It is of single-storey north light construction and is, at present, 200-ft. wide and 425-ft. long. The walls are of brick to about 4 ft. and are then of glass up to the glass and aluminium roof. A notable feature is the absence of service lines, cables conduits or pipes between the roof and the floor. All services are distributed through an underground tunnel which runs the length of the factory and has its main opening in the power house. Air, gas, water, heating and electric mains all run through this tunnel and all distribution boards fuses and branch pipes are accessible from here.

The production facilities are laid out on the modern circular system whereby goods enter and leave the building at roughly the same point, the goods circulating round central storage areas. Working conditions are of particular importance in the production of high-quality precision instruments, and much care has gone to the creation of the best possible lighting, heating and ventilation conditions.

The power house (5,000 sq. ft.) lies to the north of the factory building and is the source of all the factory services and houses the maintenance department. It is large enough to house boiler and other installations sufficient to serve three times the present factory area. It is a tall, steel-framed structure with a glass walled tower housing the main water tanks and the flues from the boilers, an arrangement obviating freeze-ups in the cold weather. At present the power house contains the main electrical switchgear, a standby diesel generator, air compressors and circulating pumps for the heating and hot-water supplies. There is a heating boiler of 9.5 mbtu per hr. rating and a hot water supply boiler of 1 mbtu per hr. rating. These are fired by pre-heated heavy fuel oil.

UK/ECSC Meeting in London

Belgium restrictions on coal imports and the UK's new lower tariff on steel imports were among the matters discussed by the Council of Association between the United Kingdom and the High Authority of the European Coal and Steel Community at its meeting in London on Thursday, June 12. There was also the usual exchange of views on coal and steel matters generally.

The UK delegation was led by Lord Mills, Minister of Power, and included Mr. J. K. Vaughan Morgan, Minister of State, Board of Trade, Sir James Bowman, chairman of the National Coal Board, and Sir Archibald Forbes, president of the Iron and Steel Board. The High Authority was represented by its president, Mr. Paul Finet, its vice-president, Mr. Dirk Spierenburg, and by Mr. Albert Wehrer and Mr. Franz Blücher, members of the High Authority.

Mr. Selwyn Lloyd, Foreign Secretary, received the High Authority delegation on Friday morning (June 13).

Birthday Honours

Recognition of services to the iron and steel, and allied industries is made in many awards in the Birthday Honours List, which was published last week. Details of some of the principal awards and biographical notes on the recipients are given below.

Barons

Mr. OLIVER BRIAN SANDERSON POOLE, for political and public services. He is a member of Lloyd's and a director of a number of companies including Acton Bolt, Limited, of which he is chairman, Airwork, Limited, and Amalgamated Asphalte Companies, Limited. Sir (THOMAS) ELLIS ROBINS, for public services in Rhodesia. Sir Ellis is president of the British South Africa Company and a director of companies closely associated with the recent industrial development in South Africa, such as the Anglo-American Corporation of South Africa, Limited, African Explosives & Chemical Industries, Limited, and Robins Conveyors (South Africa), Limited, of which he is chairman.

Knights Bachelor

Mr. WILLIAM RUSHTON BLACK, chairman of the National Research and Development Corporation, chairman of A. C. V. (Sales), Limited, managing director of Associated Commercial Vehicles, Limited, and a director of Birfield Industries, Limited, and a number of other companies. Dr. WILLIAM HERBERT GARRETT, for services to industrial relations. A director of Monsanto Chemicals, Limited, and Metal Industries, Limited, Dr. Garrett holds office as president of the British Employers' Confederation. Alderman RICHARD STEPHENSON HARPER, for political and public services in Manchester. He is a director of the Manchester Ship Canal Company. Dr. WILLIS JACKSON, FRS, director of research and education of the Metropolitan-Vickers Electrical Company, Limited, since 1953. He was a lecturer at Bradford Technical College, Manchester University, and Exeter and the Queen's Colleges, Oxford, before being appointed research engineer for Metropolitan-Vickers in 1936. He was then appointed to the Chair of Electromechanics at Manchester University and later as Professor of Electrical Engineering at the Imperial College of Science and Technology, University of London. Dr. Jackson was elected a Fellow of the Royal Society in 1953. Col. FREDERICK AUSTIN NEILL, for public services in the West Riding of Yorkshire. Col. Neill is chairman and managing director of the Composite Steel Works, Limited, Eclipse Razor Blades, Limited, James Neill & Company (Sheffield), Limited, James Neill & Company (Steels), Limited, William Smith Tool & Steel Company, Limited, and chairman of the Hallamshire Steel & File Company, Limited. He was Master Cutler in 1937-38.

Order of the British Empire
Civil Division
GBE

Lord CITRINE, part-time member of the Electricity Council and former chairman of the Central Electricity Authority since 1947. For many years Lord Citrine served as president of the International Federation of Trade Unions, for four years he was president of the British Electrical Development Association, and from 1950 to 1952 he was president of the Electrical Research Association.

Order of St. Michael and St. George
CMG

Mr. PETER FRANK DALRYMPLE TENNANT, overseas director of the Federation of British Industries.

Order of The British Empire
Civil Division
CBE

Mr. NORMAN RICHARD ROWLEY BROOKE, for political and public services in Wales. Mr. Brooke is joint managing director of Guest, Keen & Nettlefolds (South Wales), Limited, and a director of Guest Keen Iron & Steel Company, Limited, Guest Keen & Nettlefolds (Cwmbran), Limited, Nettlefolds-Stenman Hinges, Limited, Scunthorpe Rod Mill, Limited, the Somerset Wire Company, Limited, the Tentor Bar Company, Limited, and G.K.N. Reinforcements, Limited. He was appointed junior vice-president of Cardiff Chamber of Commerce in April. Mr. THOMAS WALTER FALCONER BROWN, director of Parsons & Marine Engineering Turbine Research and Development Association. Mr. ERIC KIRKHAM COLE, chairman and managing director of E. K. Cole, Limited, electrical and electronic engineers, manufacturers, etc., of Southend-on-Sea (Essex), and a director of subsidiaries and overseas associates. Mr. JOHN CORNER, senior superintendent, Physics Division, Atomic Weapons Research Establishment, Aldermaston. Professor HAROLD STEWART KIRKALDY, Professor of Industrial Relations, Cambridge University. He was called to the Bar in 1928 and for 10 years from 1929 was assistant secretary of the British Employers' Confederation. He was then appointed general secretary of the Iron and Steel Trades Employers' Association. He was appointed to the Chair of Industrial Relations in 1944. Professor Kirkaldy has served on a number of committees on labour relations and has been chairman, or deputy chairman, of various wages boards and councils. He has been a member of the Industrial Disputes Tribunal since 1952. Dr. RUDOLPH LESSING, consulting chemist and chemical engineer. He has been actively associated with smoke abatement since 1908 and was elected president of the National Smoke Abatement Society in 1956. He has continued in office as president of the retitled society—the National Society for Clean Air. Dr. WILLIAM ANGUS MACFARLANE, chief executive of the National Industrial Fuel Efficiency Service, and UK Scientific Attaché to North America from 1949 to 1954. Dr. ERIC STANLEY MOULT, a director and chief engineer of the de Havilland Engine Company, Limited, and vice-president of the Council of the Royal Aeronautical Society. Mr. LEONARD ALFRED SAYCE, superintendent of the light division, National Physical Laboratory, Department of Scientific and Industrial Research. Mr. JOHN CRIGHTON THOMPSON, deputy director of electrical engineering, Admiralty. Mr. GERALD HOWARD WILSON, chairman and managing director of Laurence Scott & Electromotors, Limited, Norwich.

OBE

Mr. THOMAS CURRAH CRAWHALL, assistant director of the Mechanical Engineering Research Laboratory, Department of Scientific and Industrial Research. Mr. RICHARD WILLIAM REYNOLDS-DAVIES, secretary, Institute of Fuel; Mr. WILLIAM WALLACE DAVIES, general manager of the Tyne Engine and Shiprepairing Works of C. H. Bailey, Limited, Barry Docks (Glam); Mr. FREDERICK JAMES DENT, director of research at the Gas Council's Midlands Research Station, Solihull (Warwickshire). Mr. JOHN THOMAS FALLON, for political and public services in Smethwick. Mr. Fallon in managing director of the Incandescent Heat Company, Limited, manufacturers of furnaces for the metallurgical industries, etc., of Smethwick, and a director of Controlled Heat & Air, Limited, Metal Porcelains, Limited, Metalectric Furnaces, Limited, the Selas Gas & Engineering Company, Limited, Thompson L'Hospied & Company, Limited, and United Thermal Industries, Limited. Mr. LIONEL HAWORTH, chief

Birthday Honours

designer, civil engines, Rolls-Royce, Limited. Mr. ARCHIBALD HENRY WILLIAM KIMBERLIN, chairman of the Leicester District Advisory Committee of the North Midland Regional Board for Industry; Mr. REGINALD WILLIAM MANN, managing director of Victor Products (Wallsend), Limited, makers of Victor air rotary mining drilling equipment, flameproof lighting, etc., of Wallsend-on-Tyne, and chairman of the Tyneside Productivity Committee; Mr. WILLIAM GREGORY MARLEY, chief radiological safety officer, Atomic Energy Research Establishment, Harwell; Mr. GEORGE MURRAY, production controller, Engineering Group, Remploy, Limited. Mr. TOM ROBERTS, principal of the technical college and secondary technical school, Ammanford (Carmarthenshire); Mr. PERCY ROWBOTHAM, principal inspector, Inspectorate of Armaments, Ministry of Supply. Mr. HARRY SAMUELS, standing counsel, Industrial Welfare Society; Mr. RICHARD PONSONBY MAXWELL WRIGHT, engineering manager, Harland & Wolff, Limited, Belfast. Mr. H. A. BROOKE, engineer, I, Aldermaston Atomic Weapons Research Establishment; Mr. G. W. CHAPMAN, division manager, Hudswell, Clarke & Company, Limited, locomotive builders, of Leeds; Mr. JAMES DARRAGH, head of the electrical stores department, Harland & Wolff, Limited, Belfast; Mr. W. G. DEBOO, chief mechanical engineer, Cathodeon Electronic Limited, Southend-on-Sea; Mr. A. E. DODD, chief information officer, British Ceramic Research Association. Mr. E. C. FERRIS, estate and works engineer, the General Electric Company, Limited, Birmingham; Mr. A. P. B. FINDLAY, leading ship draughtsman, Yarrow & Company, Limited, Glasgow; Mr. W. H. HODGETTS, production manager, copper products group of the metals division, Imperial Chemical Industries, Limited; Brig. M. A. JAMES, civil defence officer, Bristol Aeroplane Company, Limited; Mr. JOHN JONES, assistant melting shop manager, Steel Company of Wales, Limited. Mr. ROBERT LEWIS, superintendent, machine shop, Westool, Limited, St. Helens Auckland (Co. Durham); Mr. M. C. LLOYD, chairman of the Wolverhampton and District Advisory Committee, Midland Regional Board for Industry; Mr. JAMES MCCAULEY, honorary secretary and organizer, Ardeer Works Savings Group, Imperial Chemical Industries, Limited; Mr. A. E. MILES, higher executive officer, Department of Scientific and Industrial Research. Mr. ALBERT NEWBY, lately section leader in charge of special assignments, Baker Perkins, Limited, manufacturing engineers, iron, steel, and brass founders, etc., of Peterborough; Mr. ERIC SAXON, secretary, Holman, Mitchell & Company, Limited, manufacturers of lead and brass products, of St. Helens (Lancs); Mr. J. I. T. SCALLON, secretary, Vosper, Limited, shipbuilder's engineers, of Portsmouth. Mr. R. A. C. WHINNERAH, vice-chairman of the Thames Estuary District Committee, Eastern Regional Board for Industry; Mr. G. T. WHITE, works manager, guided weapons divisions, Sir W. G. Armstrong Whitworth Aircraft, Limited; Mr. EDWIN WHITELEY, clutch section controller, Crofts (Engineers), Limited, Bradford; Mr. ROLAND WINN, secretary, Summersons Holdings, Limited, railway fixed plant manufacturers, sidings contractors, etc., of Darlington.

Imperial Service Order

Mr. LESLIE JOHNS EDGCOMBE, chief experimental officer, Department of Scientific and Industrial Research.

British Empire Medal

Mr. N. BURNEY, foreman, F. Perkins, Limited, diesel engine manufacturers, of Peterborough; Mr. W. H. BUTLER, apprentice instructor, Supermarine Works, Vickers-Armstrongs (Aircraft), Limited; Mr. W. CAMBRIDGE, chargehand moulder, Ardeer Foundry Company, Limited, Stevenston (Ayrshire); Mr. A. W. P. DAVY, laboratory worker, Aldermaston Atomic Weapons Research Establishment.

Mr. W. G. ELLIOTT, foreman-in-charge of cranes, Workington Iron & Steel Company (branch of the United Steel Companies, Limited); Mr. E. F. FOREMAN, foreman of research laboratories, General Electric Company, Limited.

Mr. W. U. KERRISON, fitting shop foreman, North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne; Mr. J. MCCANNAH, chargehand mechanical fitter, Ferranti, Limited, Manchester; Mr. C. MANLEY, production foreman, Edward Curran Engineering, Limited, Cardiff; Mr. F. W. MARKS, senior foreman, Hadfields, Limited, Sheffield; Mr. C. I. MURRAY, apprentice instructor, Imperial Chemical Industries, Limited, Redcar.

Mr. H. NOBLE, foreman, J. Blakeborough & Sons, Limited, engineers and valve makers, etc., of Brighouse (Yorks); Mr. J. H. OATES, honorary collector for the savings group of the Pulsometer Engineering Company, Limited, Reading; Mr. A. PARKIN, section leader (draughtsman), Worthington-Simpson, Limited, pump and pumping machinery makers, Newark (Notts).

News from Africa

New Company

The Bristol Aeroplane Company, Limited, states that a subsidiary company, Bristol Aeroplane Company (S.A.) (Pty.), Limited, has been formed in Johannesburg, with Mr. C. F. Uwins as chairman and Mr. Noel Holman, managing director.

Rhodesian Steelworks

Que Que, the steel manufacturing centre of Southern Rhodesia, is to borrow an additional £26,129 in 1958, which will aid industrial development. The money will be used for electricity reticulation, water and ablutions in the African urban area, and for roadwork, sewerage and water supplies to the site of the Lancashire Steel wireworks, which is in course of construction.

Steel Foundry in Tororo

Uganda Development Corporation is considering plans to establish a steel foundry in Tororo. The idea is in its infancy and an examination of the economic side of the scheme is being undertaken. It is understood that, if the scheme develops, scrap metal will be used in the first stage to produce castings for industrial machines and agricultural implements.

Expansion Programme

The new blast-furnace of the African Metals Corporation at Newcastle, Natal, is expected to start up some time in 1959. With this furnace in operation, the production of foundry pig-iron will be increased by 180,000 tons per annum. The 7,500-kva. electric furnace at the Kookfontein Works of African Metals Corporation has already come into commission. This new furnace brings up the capacity of the Kookfontein Works to 50,000 kva., comprising six tank furnaces and two refining units.

Central African Federation

To encourage overseas industrialists to establish manufacturing plants in Rhodesia, the Central African Federation is shortly to become a member of the 1883 Convention of Paris for the protection of industrial property. It is also reported that the £3,000,000 copper-refinery project at Ndola is nearing completion, and the plant should be ready for operation by the middle of this year. The first extension, which will bring the output up to 110,000 long tons of copper a year, is scheduled to come into operation early in 1960.

Mechanized Handling in the Small Foundry

With labour costs at their present level, the case for mechanical handling no longer requires arguing. It is not, however, always realized that the benefits accruing from mechanization are not restricted to plants dealing with large and continuous throughputs, where it is obviously impossible to move all materials by hand. Many small firms, even those engaged in jobbing work and employing few men, can often achieve substantial savings by introducing materials-handling equipment—such as fork lift trucks —carefully selected to match requirements.

The possibilities of mechanical handling for smaller plants are illustrated by the case of Heneage Metals, Limited, of Birmingham. This company recovers non-ferrous scrap in many forms, to produce ingots to a wide range of standard and special specifications. The floor area is about 10,000 sq. ft., within which space are accommodated two 25 cwt. furnaces, two straightline casters, stocks of ingots awaiting dispatch, and departments for loading and unloading, sorting, magnetic separating, baling and preparing for the furnaces.

Handling Problems

Scrap is received in a wide variety of forms, ranging from machine turnings to vehicle radiators and coils of wire. Some scrap comes in bags, drums or used tea-chests, but much of it is delivered in mixed lorry loads, which must be sorted out. A large proportion is in the form of sheet metal and other low-density scrap, which requires a disproportionate amount of space to store and classify. Fig. 1 shows part of the sorting bay as it used to be and gives some idea of the difficulties involved. All scrap had to be manhandled, often several times, to sort out the types of metal required for a particular series of melts. It was difficult to keep a record of how much of any metal or alloy was in hand at a given time.

The handling of new ingots was not quite so difficult, in view of their small bulk and regular shape; they were stacked by hand, after removal from the casters, but much space was wasted because of the limited height to which they could be stacked with safety. Loading on to lorries, ingot by ingot, used to take a long time and absorbed a lot of labour. At busy periods, the whole shop became so congested that it was impossible to drive a lorry into the main unloading bay, and scrap had to be trucked in to the shop from the street. As further expansion at the existing premises proved impossible and the volume of work handled was growing steadily, it was decided to try the fork truck and pallet system in an effort to " put a quart in a pint pot."

The truck selected was a battery-operated, pedestrian-controlled model* as this was the most compact model of its kind available with a capacity of 3,000 lb. The body is made of steel plate at least ½-in. thick, which renders the truck practically invulnerable to damage from any kind of scrap.

* Made by Lancing Bagnall, Limited, of Basingstoke.

Palletized ingots

The way in which the ingots are now handled is shown in Fig. 2. Pallets are distributed alongside the casters and are hand-loaded with ingots as soon as they are cool. The pallets, each carrying 23 cwt. of ingots, are then lifted by the fork truck and stacked ready for dispatch. Whereas manual stacking was limited to a height of about 2 ft., the 10 ft. 10 in. lift of the truck now enables ingots to be safely stacked five or six pallets high. This means in effect that a section of floor only 15 ft. sq. can now accommodate the maximum amount of

FIG. 1.—*Unloading and sorting non-ferrous scrap by hand, before the introduction of a fork truck and pallets.*

ingot stock normally held. As can be seen from Fig. 2, the layout of the plant calls for a high degree of manoeuvrability, so that the truck's small overall length of 47 in. to the heel of the forks is a distinct advantage. The truck is driven and steered by the single rear wheel, and its steering arc of 200 deg. enables it to operate in intersecting aisles only 4 ft. 6 in. wide.

FIG. 2.—*Fork-lift truck collecting a one-ton pallet load of ingots from the casting line.*

Scrap System

To rationalize the handling of scrap metal in all its diverse forms presented more of a problem, but the saving in space and labour have been correspondingly greater. The system adopted is based on the use of post pallets. As far as possible, scrap is collected by the company's lorries in these pallets but where it is delivered by other transport, it is sorted out and palletized on being unloaded. Insulated wire is taken, in pallets, to a department where the insulation is burned off; scrap which might contain ferrous matter is fork-trucked to a magnetic separator. Turnings are bagged after classification and in some cases baled.

Manual handling has also been partly eliminated from the weighing of scrap in the preparation of charges. Scrap drawn from stock is taken by truck to the scales deposited on the low platform for weighing and taken on to the furnaces. The weight of ingot loads is similarly checked before loading on to vehicles. Since all flat pallets and post pallets are of one kind only, allowance for their tare weight is easily made.

Other duties

Within a very short time of its introduction, it was found that the truck could cope with a variety of unexpected jobs. The most important of these was the disposal of furnace slag, which now is tapped daily and disposed of to a contractor when sufficient has accumulated to form a full lorry load. The slag was formerly dumped in a pile beside the furnaces and handled by shovel and barrow. This work was so unpleasant that it was extremely difficult to obtain labour willing to deal with it.

Manual handling has now been eliminated by making use of old oil drums in which scrap is sometimes received and which are themselves difficult to dispose of. To adapt the drums to handling by fork truck, two pairs of simple lifting brackets are welded on to the outside, one pair above and one pair below the centre of gravity. The slag is now shovelled from the furnaces straight into the drums. Using the upper pair of brackets the truck picks up the full drum and, after placing it on the lorry, lifts it by the lower brackets, so that the drum tips up and deposits its contents on the vehicle. This technique has not only speeded up this work, but resulted in a cleaner roof around the furnaces.

New Facilities for PERA

Lord Chandos, chairman of Associated Electrical Industries, Limited, opened new laboratories and workshops at the Melton Mowbray establishment of the Production Engineering Research Association recently. The new buildings with equipment cost £750,000 and are the first stage of a development plan which will eventually embrace the whole of the 30-acre site.

The Association's services have been expanding rapidly in recent years and more than 600 companies now use its facilities. Total income of PERA is now some £250,000, compared with less than £10,000 from 50 firms when it was established 12 years ago.

Canadian Steel and Pig-iron Output

April's pig-iron production in Canada, at 254,970 tons, was 22 per cent. lower than the corresponding figure for 1957, and output of steel ingots during the month was 367,573 tons, a 16 per cent. drop.

Steel ingot production in the first four months of this year was at 1,500,000 tons, 14 per cent. down on the corresponding period of last year. Pig-iron output was 19 per cent. lower at 1,000,000 tons.

S & L Export Trade Recession

Previously affected by a falling-off in home trade, Stewarts and Lloyds, Limited, now reports that its export trade, particularly to the oil industry, is also seriously affected. Consequently, the directors state practically all the works are on short time, and as a result the profits for the year to September 27, 1958, will be substantially lower than those for 1956-57.

The interim dividend is to be maintained at 3 per cent. on the £20,000,000 ordinary capital, but the directors emphasize that this must not be taken as an indication that the final dividend, which was 8 per cent. for 1956-57, will remain unchanged.

Unemployment Rise Almost Halted

Although the number of unemployed registered on May 12 was 447,556, the highest since January, 1953, the steady rise of the last six months was almost halted, the total being under 4,000 more than in the previous month. The number wholly unemployed actually decreased by 18,000. Expressed in percentages of the total number of employees, the figure for May was 2.1, for April, 2.0, and for May last year, 1.5.

Notes from the Branches

South Africa

Under the chairmanship of the branch president, Mr. S. Pienaar, the South African branch of the Institute of British Foundrymen held its April meeting in the Pharmacy House Auditorium, Johannesburg, when a paper entitled "Foundry Costing and Control" was presented by Mr. R. D. Pritchard and Mr. W. H. Allen, both of African Malleable Foundries, Limited.

Mr. Allen, who presented the first part of the paper dealing with "Methods," said that it was unfortunate that time-study was usually considered solely in connection with bonus payments, whereas, in fact, it was the foundation of efficient management and costing control. In his foundry the system adopted was that of standard costing, and for this to be successful it was clear that certain conditions must be fulfilled. First, the principle of forward planning must be accepted; second, operational times must be as accurate as possible, and as near to actual operational times as could be reasonably expected to be maintained. Referring to capital expenditure, Mr. Allen said that whether it be in connection with new buildings, or machines and equipment, there should be basically the three-fold purpose of reducing labour costs, stabilizing or increasing production, and elimination of wasted effort in producing the best possible product at the most economic price in the most efficient manner.

Cost Accounting

Mr. Pritchard then defined cost accounting. In introducing the subject he said "Cost accounting is a branch of accountancy which analyses the financial accounts of a business in order to ascertain the cost of each department, process or service, and to establish the true profit or loss reflected by each section." Standard costing was defined as a method in which process and product costs are pre-determined by applying physical data to known or budgeted expanses; such information will then serve as a basis for comparing variations in cost. Before this system could be finally put into operation, the author said, there must exist the closest co-operation between the production and accounting departments, and the concept of forward planning and budgeting must be appreciated at all responsible levels.

In conclusion, Mr. Pritchard stressed that the costing department should be developed into a sort of "watch dog" or alarm system which could be relied upon to give warning when the costs of production exceeded the limits laid down, and thus avoid adverse effects on the profits estimated against selling prices. He said that the foundry industry as a whole would be well advised to overhaul and constructively criticize its costing systems, because in the near future it might well be that the investment in costing would prove to be the difference between continued profits and unexpected losses. A lively discussion followed presentation of the paper, and the meeting concluded with a vote of thanks to the authors, proposed by Mr. S. Jane.

Annual General Meeting

The annual general meeting of the branch was held in Johannesburg, in May, Mr. S. Pienaar again presiding. An election of officers took place at which it was decided that for the year 1958/59, Mr. R. C. Cross should be president; Mr. K. H. Coombs, senior vice-president; Mr. D. Gordon Jones, junior vice-president; Mr. S. Jane, hon. treasurer, and Mr. J. Steele, hon. secretary. Those elected as members of the branch Council were Mr. E. Dibden, Mr. I. Duncan, Mr. L. Hankart and Mr. S. Webster.

The president announced the branch awards for the past year as follow: *A. H. Guy Medal:* This medal had been awarded to Mr. S. Jane for his services to the branch and, particularly, for carrying out the duties of hon. treasurer for the past two years. *Members Diploma:* Mr. K. H. Coombs, Mr. M. van der Wende and Mr. D. Jepson had received this diploma for their paper entitled "Epoxy Resins for Patternmaking." *Non-members Diploma:* This diploma had been awarded to Mr. J. F. Attwell for his paper on "Practical Aspects of Abrasive Cleaning in the Foundry." *Alexander Medal:* Mr. G. H. Ford was the recipient of this medal for his paper entitled "Some Aspects of Tropenas Converter Steel," and Mr. E. Diben had received the Alexander Prize for his paper dealing with the "Common-sense of Cupola Operation."

Secretary's Report

Referring to the secretary's annual report, the president said that in this review of activities of the branch in the past year, the main emphasis was on the 21st anniversary celebrations, in February. During the year 14 papers had been presented, and four works visits had been arranged. Applications accepted for all

The illustration shows members at the banquet held in connection with the 21st anniversary celebrations, in February, of the South African branch of the Institute of British Foundrymen.

Seated (left to right): Mr. H. A. Godwin; Mr. D. Lion-Cachet (foundation member); Mr. J. Tonge; Mr. W. Simpson; Mr. John Steele, hon. secretary; and Dr. H. J. van Eck.

Standing (left to right): Mr. S. Jane, hon. treasurer; Mr. A. A. Guest; Mr. K. H. Coombs; Mr. H. Hughes; and Mr. S. Pienaar, branch president.

Notes from the Branches

grades of membership totalled 39, but the net increase was 25, and the branch membership now stood at 315. (It is of interest to note that the South African branch now has the highest number of subscribing firms (43) in the Institute.)

Reference was also made in the report to the establishment of a South African Foundry Sands Research Organization, and it was stated that it was hoped that results would eventually lead to the formation of a South African Foundry Research Organization. The report concluded with a tribute to the branch president who had so ably carried out his duties during a strenuous term of office.

Prize-winning Essays

Following the annual general meeting the prize-winning essays in the branch Short Paper Competition were presented by the authors. Mr. G. H. Ford's paper entitled "Some Aspects of Tropenas Converter Steel," commenced with a brief historical review, followed by details of current practice in a local converter steel foundry. The author stated that successful operation was governed by hot initial metal, adequate desulphurizing, careful skimming, correct weighing of the charge and the setting angle of the converter; these precautions could not be overstressed, he said. The author also described construction and lining details of the converter, operation procedure, reactions, and flame indications. Mr. Ford concluded his paper with the following statement: "Though electric furnaces are now superseding converters, the process has served the foundry well. In the case of high cost of electric current, or in localities where insufficient power is available, the Tropenas is an economical proposition. One of the major features of interest is its flexibility in the production of carbon and low-alloy steel. A number of years will elapse before all the side blown converters are scrapped in favour of other processes."

Mr. E. Dibden then presented his paper entitled "The Common-sense of Cupola Operation." In the introduction, Mr. Dibden stated that the cupola was probably the most widely used industrial melting unit, which was subjected to more ill usage than could be sustained by any other type of furnace and still give passable results. The application of a little common sense and a few fundamental principles could produce some very gratifying results from a cupola, whether particularly well designed or not. The author then dealt briefly with cupola size and design, covering melting rate, diameter, depth of well and similar features. A section on air supply underlined the importance of this feature. The paper continued with a step-by-step description of the preparation and operation of this unit from the making of the bed to the final tap. With regard to the poor quality coke available in South Africa, the author suggested that it might be necessary on long runs with high metal temperatures, to double up the coke charge at frequent intervals to be certain of maintaining the bed height, but, theoretically, spreading the total weight of extra coke over each charge to give higher coke ratios should have the same effect and was to be preferred.

Northampton Section

The annual general meeting of the Northampton and district section was held at the Hind Hotel, Wellingborough, on April 17, when the following officers were elected:— As president, Mr. J. T. Stevens; as senior vice-president, Mr. H. Edge; and as junior vice-president, Mr. R. Jelley. Mr. J. W. Deaton, Mr. C. H. Hanson and Mr. J. H. Gray were elected to the Council and Mr. W. D. Ford was re-elected honorary secretary. The secretary reported that once again there had been a small but steady increase in attendance and membership and that the section was now well established. The retiring president, Mr. T. Reynolds, thanked all the officers for their help during the past year and Mr. Ben Hird (past-president) proposed a vote of thanks to Mr. Reynolds for his hard work during his term of office; this was carried with acclamation.

Then followed a paper given by Mr. W. B. Parkes, assistant development manager of the British Cast Iron Research Association, entitled "Behaviour of Moulding Sands at High Temperatures."* Mr. Parkes explained the need for apparatus that would raise the temperature of a sand test-piece rapidly and uniformly to bear relationship to the conditions of the heated mould surfaces when cast. A description of the dielectrically-heated apparatus followed and some of the snags encountered and overcome in its construction were dealt with.

The author then described tests carried out and results obtained. These showed that the expansion of sand increased with hardness of ramming. The addition of coaldust and wood-flour has little effect on expansion except when quantities affect ease of compaction. Wood-flour additions and fibrous materials such as asbestos, slightly increase deformation and reduce brittleness—the most important features in the prevention of scabs caused by expansion. Coaldust has little effect on deformation, but reduces brittleness slightly. Results obtained from conventional methods of heating test-specimens have little or no bearing on the behaviour of a mould when cast. All results achieved were adequately illustrated with the aid of slides, and question time proved a most amusing though by no means uninstructive half hour.

* Published in the JOURNAL, August 11, 1955.

Australia (Victoria)

The May meeting of the Australia (Victoria) branch of the Institute was held in the Union Dining Room of the University of Melbourne. It took the form of a round-table conference on "Coremaking," at which the following speakers introduced the subjects for discussion: Mr. Don Fry (Birmid Auto Castings) spoke on "CO_2 Cores," Mr. Alan Mills' subject was "Oil-sand Cores," and Mr. Dudley Carmichael (Custom Cores) introduced "Shell Cores." The conference was preceded by a cocktail reception and dinner.

Traffic at South Wales Ports

In common with traffic at a number of other British ports, total tonnage passing through the South Wales ports during the four weeks ended May 18 again showed a decrease on the comparable figure for 1957. At 1,229,141 tons, the drop was about 149,000 tons. Inward traffic, which totalled 674,476 tons, declined by 84,000 tons, compared with last year, principally among iron ore (51,000 tons), iron and steel goods (25,000 tons), and coal, coke, and patent fuel (14,000 tons).

Exports were some 65,000 tons below last year's level. Shipments of tinplate increased by 6,000 tons, but coal, coke, and patent fuel dropped by 71,000 tons, and iron and steel manufactures by 13,000 tons.

The 1958 tonnage through the seven ports (1957 figures in parentheses) for the period January 1 to May 18 are as follow:—Newport, 993,969 (929,536) tons; Cardiff, 719,364 (909,680) tons; Barry, 714,182 (972,363) tons; Port Talbot, 784,002 (977,103) tons; Swansea, 2,910,991 (2,475,680) tons; Penarth, 174,443 (226,357) tons; Lydney, 19,628 (31,555) tons.

News in Brief

HONEYWELL-BROWN, LIMITED, has changed its name to Honeywell Controls, Limited, and on June 1, all head office departments and the London branch office moved from Perivale to a new building at Ruislip Road East, Greenford, Middlesex. (Telephone: WAXlow 2333.)

SPENCER & HALSTEAD, LIMITED, Ossett, Yorkshire, announce that Mr. R. Mellor, of 48, Aberdeen Street, Rusholme, Manchester, has been appointed north-western area representative, covering North Wales, North Staffordshire, Cheshire, Lancashire, Cumberland and Westmorland.

THE SECOND International Nickel Company of Canada, Limited, Award in Journalism was made recently to a Cambridge University graduate, Mr. T. S. Green, of Beccles, Suffolk, who achieved the highest standing in the graduate course in journalism at the University of Western Ontario.

IT IS REGRETTED that the speech of the chairman of the National and Midland Ironfounders' Association, (reported in the JOURNAL, June 5, page 695), was attributed to Mr. J. W. Gardom, the president, instead of Mr. W. H. Thursfield, J.P., who is now the chairman of the Association as was correctly reported.

BRITISH OVERSEAS AIRWAYS CORPORATION will introduce long-range Britannia turbo-prop airliners on the routes between Britain and South Africa on July 27. These airliners, a larger version of the Britannias now operating down to Johannesburg, will offer faster schedules and greater payloads on these routes.

THE CERTIFICATE OF INCORPORATION of the Institute of Industrial Supervisors was issued by the Registrar of Companies on March 21. On this date the Institute was incorporated as a company limited by guarantee under the 1948 Companies Act, and received permission from the Board of Trade to omit the word "Limited" from its title.

Mr. R. WILLIS, group production director of Darwins, Limited, Sheffield, opened the eighth annual sports field day of Darwins Sports Association at Tinsley, Sheffield on June 7. Mr. A. Torry, technical director of the group, and Mrs. Torry, presented the prizes. An innovation was an exhibition by the British Iron and Steel Federation.

THE YORKSHIRE ENGINE COMPANY, LIMITED, Sheffield, has secured an order worth £350,000 for 16 diesel-electric shunting locomotives for the Port of London Authority. Delivery is due to start in April. The engines will be twin-engined 400-h.p. units and single, 300-h.p. engines, and will be used on heavy shunting duties at the Royal and Tilbury docks.

ON STAND NO. 6, inner row gallery, National Hall, Olympia, venue of the Chemical and Petroleum Engineering Exhibition, Steele & Colishaw, Limited, Stoke-on-Trent, are exhibiting their Steel-Shaw high-speed ball mills; quickway shakers; oblicone and diamond blenders; Kady kinetic dispersion mills, and flexible couplings. The exhibition was opened yesterday (June 18), and will close on June 28.

ABOUT FIFTY BRASSFOUNDRY WORKERS, employed by the North British Locomotive Company, Limited, Glasgow, will lose their jobs at the Fair holidays when the iron foundry at Hydepark Works closes down. This foundry will be the only part of the company's activities affected. The closure is being brought about by the changeover from steam to diesel trains, and the introduction of new methods.

CRAVENS, LIMITED, Darnall, Sheffield, share in the recent order of the British Transport Commission for 217 diesel multiple-unit train vehicles, each 57-ft. long, comprising 56 three-car and 24 two-car sets and one powered car, for use on the Eastern, North Eastern and Scottish Regions of British Railways. Their share of the order includes 24 two-car sets for use on the Eastern Region, and 22 sets for the Scottish Region.

A CONTRACT worth approximately £500,000 has been signed by Motorimport, the Polish Government Purchasing Agents, and Leyland Motors, Limited, in conjunction with its associated company in Denmark, for 80 underfloor-engined Royal Tiger Worldmaster single-deck coaches. This is the third large order that the company has received from Poland within the last few years, bringing the total up to 300 buses and coaches.

A £500,000 DEVELOPMENT SCHEME was inaugurated at Aberdeen last week by the Scottish Gas Board. It consists of a new continuous vertical retort installation and a new coke-screening plant at one works in the city and a new gasholder of 3,000,000 cub. ft. capacity at another. The plant marks the completion of the post-war modernization scheme which has doubled the pre-war gas-producing capacity of the gasworks, which can now produce 15,000,000 cub. ft. a day.

"THE INCREASE IN THE NUMBER OF WASHING MACHINES during the last 10 years from only 2 per cent. of households in 1947 to 23 per cent. in 1957, has been probably the most noteworthy development in the domestic-electric appliance business," said Mr. J. I. Bernard, director and secretary of the Electrical Development Association, at the British Electrical Power Convention at Brighton, last week, when speaking on the development of the electrically-equipped kitchen.

THE SEVENTH INTERNATIONAL SYMPOSIUM on "Combustion," organized by the Combustion Institute in collaboration with the Institute of Fuel, is to be held at the Royal Institution of Great Britain, 21, Albemarle Street, London, W.1, and in the university city of Oxford, from the evening of August 27 to Midday September 3, inclusive. Prospective participants can obtain further details from the Institute of Fuel, 18, Devonshire Street, Portland Place, London, W.1.

A PETITION for the winding up of Project Mayflower, Limited, the company which sent Mayflower II across the Atlantic last year on a goodwill cruise, with Thomas W. Ward, Limited, Albion Works, Sheffield, judgment creditors for £547, as petitioners, was further adjourned for a month in the Chancery Division on Monday, June 9. Mr. Bryan Clauson, for Thos. W. Ward Limited, said the petition had been before the court on several occasions. There were a number of opposing creditors.

FOLLOWING THE RECENT TOUR in Rhodesia and South Africa of Mr. W. J. W. Proctor, sales director of Follsain Wycliffe Foundries, Limited, the appointment of the following agents is announced:—For the Union of South Africa—H. Incledon & Company (South Africa), Limited, P.O. Box 3620, Johannesburg; for Northern Rhodesia (except Livingstone)—J. L. Curtis, Limited, P.O. Box 140, N'dola, and for Southern Rhodesia and Livingstone—Mine-Elect (Pvt), Limited, P.O. Box 316, Bulawayo.

CATERPILLAR TRACTOR COMPANY, LIMITED, Glasgow, will be introducing at the Royal Show, to be held in Bristol from July 1 to 4, the first D8 crawler tractor to be built in Great Britain. Produced at the company's new Glasgow tractor factory, the tractor will be equipped with a No. 8a cable bulldozer and No. 29 cable control. Other exhibits include scrapers, bulldozers, and working cutaway models of the Caterpillar oil clutch D337 (F) engine and a display of replacement parts. (*Stand No.* 260.)

News in Brief

Mr. V. R. PREHN, of Ruston & Hornsby, Limited, Lincoln, presented the trophies at the 15th annual Fire Brigade competitions, organized by Grantham Fire Officers' Committee at Sincil Bank, Lincoln on Saturday, June 7. The chairman was Chief Officer Harry Sismore, of Blackstone & Company, Limited, Stamford. The Read Aggregate Cup was won by Ransome & Marles Limited, Newark; the Sarah Barnes Cup by Ruston & Bucyrus, Limited, Lincoln; and the Lincolnshire Industrial Brigades Cup by Aveling-Barford, Limited, Grantham.

IT IS STATED in the report of the Fire Research Board, that plans for the permanent Fire Research Station of the Department of Scientific and Industrial Research and the Fire Offices' Committee have now reached an advanced stage, and it is hoped that building will begin this year. Until now, the station has been making-do with temporary laboratories that are not suited to all the needs of practical investigations of fire. The exception to this is the well-equipped "Furnace Building" now in use and a models laboratory in course of erection.

AT THE ANNUAL CONFERENCE of the members of the Berne Union of Export Credit Insurers, held this year in Venice, the German delegate explained the true nature of the new facilities now being set up in Germany to finance export trade, which have been the subject of extensive and inaccurate comment in the Press of other countries. The conference welcomed an assurance from him, given with the authority of the Federal Minister for Economics, that the Federal Government has no intention of initiating a race in the field of export credit terms.

Mr. I. M. STEWART, chairman of Thermotank, Limited, Glasgow, who recently returned from a visit to Detroit, announced that his firm had secured a contract for the installation of a ventilating system in the Government Services Administration building—the largest Government building to be erected in Washington since the war. The contract was secured in face of strong competition from other American concerns. Mr. Stewart, whose firm has two factories in Detroit, said that despite the recession in America, there were great possibilities for expansion. He is making another trip to Detroit in October.

THE FIRST PART of the large sea-water distilling plant in the Island of Aruba installed by G. & J. Weir, Limited, Glasgow, has commenced operation and is adding more than half a million gallons of fresh water daily to the island's supplies. The complete plant will, it is claimed, be the largest in the world when it is in full operation, and the order was obtained by Weir's in keen competition with suppliers in a number of other countries. Four more of these plants are in course of completion, and work is also proceeding on large installations to provide fresh water from the sea in the adjoining Island of Curacao, and in the British Colony of Nassau (Bahamas).

Mr. W. CARRON, president of the AEU, said at the conference of the North Midland Region of the Institution of Production Engineers, held at the works of A. A. Jones and Shipman, Leicester, on June 7, "The trade union movement will continue to press for shorter working hours and higher wages. I am convinced that these pressures will contribute to efficiency in industry." He said it was nonsense to say that industrial problems would be overcome if everyone worked a lot harder and longer. Mr. Carron said that the spread of strikes was due to loyalty among trade unionists rather than enthusiasm for the cause of strikes. He added that strikes did not necessarily reflect the true attitude of all concerned.

SPEAKING AT A LUNCHEON held in connection with a symposium on "Aluminium in Packaging," Mr. S. E. Clotworthy (managing director, Northern Aluminium Company, Limited), the president of the Aluminium Development Association, said some 15 per cent. of all aluminium in the wrought forms fabricated in the UK goes into packages, whilst the merits of aluminium for foil wrapping, for seals, for collapsible tubes and many other containers was fully established. Mr. Clotworthy quoted as an example the annual consumption of aluminium foil—exceeding 5,000 tons—for milk-bottle tops in the UK alone. The greater expansion of self-service stores and pre-packaging generally would increase the part played by aluminium—but this applied not only to foodstuffs and pharmaceutical goods but also to many other industrial materials.

MEMBERS OF WOLVERHAMPTON AND DISTRICT ENGINEERING SOCIETY visited, on June 11, the works of Brown Lennox & Company, Limited, at Pontypridd, where they saw an old link-testing machine designed by the company's founder Samuel Brown—the R.N. captain who introduced metal mooring and anchor cables to maritime practice. They also watched initial proving trials on the first Asea-Svets Swedish chain-making machine to be installed in Britain. Costing £150,000 the machine employs flash butt welding and takes only three minutes to form huge stud links in mild-steel diameters up to four inches. The party was welcomed by the works director, Mr. A. G. G. Gilbertson. The visit was arranged by Mr. J. D. Stuart, managing director of the Tipton foundry of Joseph Wright & Company, Limited, a subsidiary of the Brown Lennox group.

THE BIRMINGHAM HEADQUARTERS of the Metals Division of I.C.I., Limited, announced on June 4, that its new £3,000,000 factory at Waunarlwydd, near Swansea —claimed to be the first plant in the world to be devoted entirely to the production of wrought titanium —is in operation. The Birmingham plant at Witton will feed the S. Wales plant with the titanium ingots. The company states that it has great confidence in the long-term future of the material, and a spokesman said that increasing demands for titanium were now anticipated from the chemical, petroleum, textile and pulp-making industries. Especially notable was the considerable development work on the introduction of titanium into chemical plant. The ICI subsidiary, Marston Excelsior, Limited, of Wolverhampton, was playing a major role and had already found new fabricating and welding methods.

A DUCK SUPPER at a Warwickshire country inn was the first social occasion arranged for members of the newly-formed "25 Club" for employees of the Aston Chain & Hook Company, Limited, of Erdington, Birmingham. Membership is confined to those who have completed a quarter of a century or more with the company, and the aggregate length of service of the 31 founder-members totals 1,120 years—an average of more than 36 years each. Senior member is Mr. Alfred Such, chain machine setter-operator, who has completed 50 years with the company. Blue enamel and silver badges were presented to the "Twenty Fivers," who in return sprang a surprise on their managing director. Mr. Noel Bond-Williams (who has a further three years to do before qualifying), presenting him with a yachtsman's stopwatch. Other non-member guests were the Hon. John Grimston, chairman of Enfield Rolling Mills, Limited, the parent company, and Mr. Clifford Atkins, a director of the Aston Chain & Hook Company.

BILSTON

Rolled Steel MOULDING BOXES

Interchangeable • Accurately jigged and reamed. Withstand rough handling. Long life without distortion. Sizes and shapes to requirements.

BILSTON STOVE & STEEL TRUCK CO. LIMITED
BILSTON • Phone: BILSTON 41921 • STAFFS

• Agents for London & the Home Counties, FOUNDRY SUPPLIERS LIMITED.
25A, Cockspur St, London, S.W.1 'Phone: TRAfalgar 1141

CYCLONE SYSTEMS FOR FOUNDRIES

Dust Removal, Fume Extraction, Cooling, Ventilation, Coleman Core and Mould Ovens.

These Cyclone Plants improve conditions and increase output. If you are at the planning stage for new Plant, or improving existing works, please ask for our advice and benefit from our 70 years' experience.

Telephones :
Swinton 2273 (4 lines)
London : NEW Cross 6571 (4 lines)

MATTHEWS & YATES LIMITED
SWINTON (Manchester) and LONDON
also at Glasgow, Leeds, Birmingham, Cardiff, Bournemouth

Personal

Mr. D. STANDEN has been appointed a director of Sterling Industries, Limited.

Major C. J. P. BALL has been appointed a director of the British American Metals Company.

Mr. FRANK BOWER has succeeded LORD RIVERDALE as president of the Association of British Chambers of Commerce.

Mr. J. J. BOEX, controller of associated interests of the British Aluminium Company, Limited, has been appointed a director of the company.

Mr. H. J. FURNESS was elected president of the Institute of Cost and Works Accountants at the Institute's annual meeting in London.

Mr. A. S. BEECH arrived back in England last Thursday after participating in the American Foundrymen's Society's Congress at Cleveland, Ohio.

Mr. S. D. BROWN, secretary since 1943 of the Blythswood Shipbuilding Company, Limited, has been elected an additional director of the company.

Mr. PETER H. JACKSON, M.C., has been appointed home sales manager of the Lancashire Dynamo Group which he has served for more than 20 years.

Mr. H. W. BOYNE, who until recently was home sales manager of Arthur Balfour & Company, Limited, has joined Colloidal Graphite, Limited, of London and Sheffield.

Mr. WILLIAM JACKSON has been elected president of the Association of Certified and Corporate Accountants for 1958-59. Mr. J. E. HARRIS has been elected vice-president.

Mr. WALTER WEST, managing director of West Yorkshire Foundries, Limited, Saynor Lane, Leeds, has been appointed, in addition to that post, chairman of Scammell Lorries, Limited.

Mr. and Mrs. FRED SMITH have celebrated their golden wedding. Mr. Smith is a director of Walker & Smith (Batley), Limited, machine makers, Bradford Road, Batley, where he has worked for 62 years.

Dr. DACCO, the president of the Italian foundrymen's association, has been nominated vice-president of the International Committee of Foundry Technical Associations. He is expected to preside over the 1959 congress to be held in Spain.

Mr. J. W. BOTTOMLEY, forge foreman at Charles Roberts & Company, Limited, Railway Wagon Works, Horbury Junction, has been presented with a tea-set by members of the works staff to mark his retirement after 51 years with the firm.

Mr. JOHN PRESTON, manager of the steel-fabricating shop of Mitchell Russell & Company, Limited, Chattan Foundry, Bonnybridge, up till two years ago, was presented with a wireless set from the staff when he retired recently after 28 years with the firm.

Mr. FREDERICK CATTOIR, a director of Henricot Steel Foundry, has been elected chairman for three years of the Belgian Chamber of Commerce in Great Britain. Mr. J. WAUTERS has been elected deputy chairman, and Mr. E. J. J. VAN HOOF vice-president d'honneur.

The EARL OF ELGIN AND KINCARDINE has resigned from the board of Scottish Motor Traction, Limited, in order to reduce some of his business commitments in view of his advancing years. He will, however, continue his association with the company in an advisory capacity.

SENOR ALBERTO PHILIPPE, world president of the Junior Chamber of Commerce International, visited Walsall and Birmingham during the week of June 2 to 7 at the invitation of Mr. Leon Jessell, European president. He was present at a civic luncheon given in his honour at Walsall.

Mr. ALEXANDER ABEL SMITH, vice-chairman of the Bryan Donkin Company, Limited, has been elected chairman in place of Major DESMOND ABEL SMITH, who has retired from the board. Mr. R. T. REDFERN, managing director, also becomes vice-chairman, and Vice-Admiral Sir CONOLLY ABEL SMITH has joined the board.

Mr. D. LION CACHET, managing director of the East Rand Engineering Company, Limited, Germiston, South Africa (one of the oldest and largest ironfoundries in the Union) is to visit the U.K. during July for consultations with executives of the General Electric Company, Limited, with whom the East Rand company has a manufacturing agreement.

Mr. G. V. PALMER has been elected chairman of Council at the Institute of Export. Mr. Palmer, who has been on the Council since 1950, is a director of Winget and a member of Lloyd's. He is vice-president of the Association of British Sales Promotion Executives and was vice-chairman of the British Export Trade Research Organization Council from 1950-52.

Mr. JOHN STEELE, hon. secretary of the South African branch of the Institute of British Foundrymen, has been appointed business manager of Lawrence H. Tearle & Company (Pty.), Limited, publishers of trade and technical journals in South Africa. On taking up his appointment this month, Mr. Steele will join the board of directors, and will be stationed in the Johannesburg head office.

Mr. W. J. MORGAN will be retiring as general manager of the Machine Tool Trades Association at the end of this month, but will continue in the non-executive capacity of adviser. From that date Mr. H. O. BARRETT will assume the overall responsibility of Association affairs. Mr. GUY CHESHAM, while continuing as public relations officer, will be concerned with the Association's European and other overseas activities.

Mr. A. CIBULA and Mr. R. EBORALL have been appointed research superintendents of the British Non-Ferrous Metals Research Association. They will be jointly responsible to the director for the work of the research department. These appointments will fill the vacancy arising from the resignation, at the end of July, of the research manager of the association Dr. W. A. BAKER, who is leaving to join the Northern Aluminium Company, Limited.

Obituary

The death has occurred of Mr. CHARLES BUCK, a foreman at the Haslam Foundry and Engineering Company, Limited, Derby, for 45 years until his retirement. He was 87.

Mr. A. E. J. CONNOR, a director and manager of the agricultural engineering firm of E. C. Plesence, Limited, Wisbech (Cambs), has died at the age of 43. He first became associated with the company nine years ago.

The death occurred on June 1 of Mr. THOMAS HENRY HINCHCLIFFE, who until his retirement a year ago was chairman of the Hepworth Iron Company, Limited, Hazlehead (Yorks). He was 80. Mr. Hinchcliffe was appointed a director of the company in 1911 and became chairman in 1945. In 1949, he was presented with his portrait in oils by Mr. B. Fleetwood-Walker to mark his 37 years as a director of the company.

Changes of Name

Among companies which have recently changed their names are those listed below. The new titles are given in parentheses.

REGAL PRECISION TOOL COMPANY, LIMITED, Pottery Road, Newport, Mon (Newport Precision Engineering Company, Limited).

INDUSTRIAL & MARINE PROTECTIVE APPLICATIONS, LIMITED, Barnbrook Works, Fountain Street, Barnbrook, Bury (I.M.P.A., Limited).

HEAFIELD MARKETING COMPANY, LIMITED, metal goods dealers etc., of Connaught Street, Oldham (Heafield Industries, Limited).

SHAFFER PRODUCTIONS, LIMITED, engineers, etc., of B.M.A. House, Tavistock Square, London, W.C.1 (Goring Rentals, Limited).

BURSGREEN SALES, LIMITED, machinery factors, etc., of Green Lane Works, Green Lane Road, Leicester (W.B. Facilities, Limited).

G. R. GILBERT, LIMITED, mechanical engineers, ironfounders, etc., of Hackbridge Mills Estate, Hackbridge, Surrey (G. & R. Gilbert, Limited).

EXTRUSION (HOLDINGS), LIMITED, iron and steel stockholders, etc., of 10, New Court, London, W.C.2 (Raine & Company (Sales), Limited).

LIVERPOOL VENTILATING & AIR CONDITIONING COMPANY, LIMITED, 18, Cook Street, Liverpool, 2 (Liverpool Heating & Ventilating Company, Limited).

SELF-PRIMING PUMP & ENGINEERING COMPANY, LIMITED, Parliament Mansions, Victoria Street, London, S.W.1 (Spe Company, Limited).

HARRINGTON'S (WOLVERHAMPTON), LIMITED, Dawley Brook Works, Kingswinford, Brierley Hill, Staffs (Harringtons (Engineers), Limited).

JOHN A. WILSON & COMPANY, LIMITED, electrical and mechanical engineers, etc., of 53/9, Great George Street, Liverpool, 1 (I.C.R. (Engineers), Limited).

J. BARNES & SON (AGRICULTURAL ENGINEERS), LIMITED, Bodle Street Green, near Hailsham, Sussex (J. Barnes & Son (Agricultural & Marine Engineers), Limited).

B. O. MORRIS, LIMITED, machine and engineering accessory manufacturers, etc., of Morris Flex Works, Briton Road, Coventry (B. O. Morris (Holdings), Limited).

SIR JOHN PAYNE GALLWEY, BT., & PARTNERS, LIMITED, constructional engineers, etc., of 356-368, Evelyn Street, London, S.E.8 (Sir John Gallwey & Partners, Limited).

LEONARD MELLOR (WAKEFIELD), LIMITED, copper cylinder and boiler manufacturers, etc., of Orchard Chambers, Church Street, Sheffield, 1 (Till, Mellor (Wakefield), Limited).

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

ASHTON-IN-MAKERFIELD, LANCS, June 28—In connection with the Cranberry Lodge drainage scheme, for the UDC, requirements include the construction of approximately 22 lin. yd. of 4-in. dia. spun-iron rising main. Documents from the Surveyor, Town Hall, Ashton-in-Makerfield. Deposit £2 2s. 0d.

BELGIUM, June 26—Grinding and polishing wheels and wire brushes. (ESB/14947/58.)

BRITISH EAST AFRICA, June 30—Manhole covers and frames. (ESB/15067/58.)

BURMA, June 26—Platform weighing machines. (ESB/14733/58.)

GLANFORD BRIGG, July 5—Requirements in connection with the Scawby and Scawby Brook sewerage scheme (Contract No. 1) include the provision and laying of 2,110 yd. of 5-in. dia. spun-iron rising main. Documents from John H. Haiste and Partners, Belmont House, 20, Wood Lane, Headingley, Leeds, 6. Deposit £3 3s. 0d. by cheque payable to the Glanford Brigg RDC.

INDIA, July 8—Wheel centres and tyres for the Indian railways. (ESB/14960/58.)

SOUTH AFRICA—Mr. J. R. Mitchell, a director of S.A. Furnace & Engineering Company (Pty.), Limited, 806, Elizabeth House, Johannesburg, is interested in obtaining UK agencies for foundry equipment. He is particularly interested in compacting machines, sifters and vibrators. (ESB/14656/58.)

SOUTH AFRICA, July 4—Hosepipe clips and malleable-iron couplings. (ESB/14486/58.)

THAILAND, August 8—Diesel railcars. (ESB/14345/58.)

The foundry-yard is the graveyard of moulding boxes

Save this loss and expense by using

EXTENDIBLE TAPERED

SLIP-OFF FLASKS

- One flask does the work of many conventional moulding boxes
- No boxes left idle to rust in the rain
- One flask in use the whole time
- No capital lying idle in boxes waiting to be poured or knocked out, or not in use at all
- The flasks are extendible and the size can be changed as required
- Saving of heavy capital expenditure in many different sizes of boxes
- Double pins are a special and unique feature of these flasks and give easy trouble-free lift-off

W. J. HOOKER LTD.

239a FINCHLEY ROAD, LONDON, N.W.3

Phone: Swiss Cottage 3281-2-3

Raw Material Markets

Iron and Steel

Pig-iron outputs keep abreast of present demands from all sections of the foundry industry, and, in fact, in all grades surplus tonnages are available. Plentiful supplies of raw materials are on hand at the furnaces. Iron-ore imports are maintained at high levels, while deliveries from home sources are also appreciable, these tonnages providing adequate supplies for consumption and stock requirements. Blast-furnace coke is also in fairly good supply.

There is little change in the pattern of business which has prevailed at the foundries for some time past. The figures issued by the Iron and Steel Board of production of castings in the first quarter of 1958 indicate the present trend of business. Although the motor vehicle trade received a setback on account of the recent strike, this is likely to be only temporary and the establishments which found it necessary to reduce their outputs are expected to return shortly to full production. These foundries continue to take up appreciable tonnages of low-phosphorus pig-iron, and with the tonnages being supplied to other users the major portion of outputs is absorbed. Fairly good supplies of hematite and some refined irons are also being utilized. In all three grades the furnaces have little difficulty in satisfying customers' needs and could increase deliveries if required. Demands for castings for the engineering trade continue to show a slight decline, as also do the requirements of the machine-tool makers.

The building and domestic trades show no sign of recovery; this continues to be reflected in the low output of castings at the light foundries. Many of the jobbing foundries have a fair amount of work on hand, but as is the case also at the textile foundries, they could undertake a much bigger demand for castings. Makers of high-phosphorus pig-iron are unable to obtain sufficient orders to clear their present makes, and additional expense continues to be incurred by the necessity of having to stock appreciable tonnages.

All grades of foundry pig-iron and hematite are available for shipment. Some orders are being obtained, but competition is becoming keener from overseas makers.

With fairly good stocks of steel semis still on hand, demands for billets, etc., from the re-rollers continue on a moderate basis. They are finding it extremely difficult to obtain orders for their products and most of the mills are still on short time. There is a fairly good call for reinforcing rods, but there is little improvement in the demand for sections and bars, and the mills find it extremely difficult to obtain sufficient tonnage to make up their rollings.

Non-ferrous Metals

Copper was more than firm in London last week; it was strong. The reason is not far to seek. The US Government announced a plan for a one-year stockpiling programme under which it would purchase 150,000 tons of US-produced copper at prices up to 27½ cents a pound. The reaction to this cheering news was immediate on both sides of the Atlantic. In London, the price soared £12 a ton to close higher than £20 a ton. Later, the price reacted, but the quotation is still well above the £200 level. In America the custom smelter price spurted to 26 cents a pound and activity was brisk. This was an unusual move as it placed the custom smelter price a full cent higher than the producers' price. But it was dictated by the tight scrap market from which insufficient metal was forthcoming for the smelters to meet their commitments. It was the failure of the producers to raise their price that injected caution into the London market and also the reminder that an import duty of 1.7 cents a pound—equivalent to about £14 a ton—would automatically come into force on July 1 unless the duty was suspended again. The proposed stockpiling plan suggests that this will be done, although it is not certain. On Tuesday the custom smelter price moved up to 26.50 cents and Anaconda raised its price by 1½ cents to 26½ cents a pound.

In any event, activity in London is very good and with copper stocks still declining it must be so that the European output/demand picture is roughly in balance. The one point worth bearing in mind is that after such a sharp upward movement there may well be a corrective movement. This comment is, however, only common sense and commodity markets have never paid much attention to this as a criterion. Anyway, the Belgian price is now correspondingly higher—27½ fcs. per kilo against 26¼ fcs. The proposed stabilization plan and the price increase was considered "helpful" in Chile, but it was stated that the 1958 production would not be increased.

Tin is still bumping along on the floor at £730 a ton for cash and approximately £732 to £732 10s. for three months' metal, with the US price moving narrowly between 94½ and 95 cents a pound. The position is unrelieved, the only feature being the growing shortage of Straits tin. This may well get worse. If so, the premium for this grade of tin will increase. Latest figures show that US consumption is still on the down grade, but that production is also trending at a faster note in the same direction. Despite the unknown production capacity and potential supply position of the USSR, it is hard to shake the belief that the price of tin will not go higher. US steel production is climbing and the output and sales of automobiles is slowly rising. If these two important sectors of the American economy really begin to gather strength and result in a revival of demand for tin, the quotation must shoot up sharply. Agitation is growing for Russia to be asked to join the International Tin Council.

Lead, though still dull here and idle in New York, developed a firmer undertone on the hope that a stabilization plan similar to that for copper will be put into effect for lead. Actually, there is a proposal circulating in Washington asking for the US Government to buy 350,000 tons of domestically produced lead at 14½ cents a pound. This would be an alternative to import duties and would mean that the US Government would subsidize producers to the extent of the difference between the actual market price, which is now 11 cents a pound, and the proposed price of 14½ cents a pound. Something will be done for lead. But exactly what, is anybody's guess at this time.

In zinc, the market has been thoughtfully provoked by the hope that zinc will be subsidized by the US Government buying 550,000 tons at 12½ cents a pound. This proposal is at the moment only on paper and it remains to be seen whether it will be raised by Senator Seaton when he testifies this week before the Minerals Sub-committee of the Senate Interior Committee. Meanwhile, demand in London is satisfactory but featureless and poor in New York, where the price is called 10 cents a pound.

SOAG MACHINE TOOLS, LIMITED—Mr. M. O. L. Lynton has been appointed to the board.

W. T. HENLEY'S TELEGRAPH WORKS COMPANY, LIMITED—Sir John Dalton has resigned the chairmanship and is succeeded by the deputy chairman, Sir Alexander Sim. Sir John remains a member of the board.

THE
CHEMICAL
AND
PETROLEUM
ENGINEERING
EXHIBITION
18th JUNE to 28th JUNE
OLYMPIA
Stand No 5 row F
BAKER PERKINS
LTD
Engineers
WESTWOOD WORKS – PETERBOROUGH

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

June 18, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 0s. 0d. to £47 10s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £66 0s. 0d. to £66 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 4d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 4d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £91 10s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £87 10s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 0d. per lb. Cr; 1 per cent. C,* 2s. 0½d. per lb. Cr; 0.15 per cent. C,* 2s. 1½d. per lb. Cr; 0.10 per cent. C,* 2s. 1¾d. per lb. Cr; 0.06 per cent. C,* 2s. 2d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 2½d. to 7s. 9½d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £83 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s., 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over: £40 0s. 6d; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £205 10s. 0d. to £205 15s. 0d.; three months, £206 5s. 0d. to £206 10s. 0d.; settlement, £205 15s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 11½d. per lb.; rods, 226s. 0d. per cwt. basis; 20 s.w.g., 259s. 3d. per cwt.

Tin.—Cash, £730 0s. 0d. to £730 10s. 0d.; three months, £732 0s. 0d. to £732 10s. 0d.; settlement, £730 10s. 0d.

Lead (Refined Pig).—Second half June, £77 0s. 0d. to £77 5s. 0d.; second half September, £77 7s. 6d. to £78 0s. 0d.

Zinc.—Second half June, £67 5s. 0d. to £67 10s. 0d.; second half September, £67 15s. 0d. to £68 0s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £98 2s. 6d.; rolled zinc (boiler plates), all English destinations, £95 17s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £85 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 6¾d. per lb.; sheets to 10 w.g., 168s. 6d. per cwt.; wire, 2s. 4½d.; rolled metal, 168s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £139; B6 (85/15), —; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £170; HTB2 (38 tons), — ; HTB3 (48 tons), £180.

Gunmetal.—BS1400, LG2 (85/5/5/5), £168; LG3 (86/7/5/2), £179; G1 (88/10/2/½), £238; (88/10/2/1), £229.

Phosphor Bronze.—BS1400, PB1 (AID released), £252 per ton.

Phosphor Bronze Strip, etc.—Strip, 250s. 6d. per cwt.; wire, 3s. 8½d. per lb.; rods, 3s. 0d.; tubes, 3s. 0d.; chill cast bars: solids 2s. 11½d.; cored 3s. 0½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 6½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 11d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 10d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £76 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £190 0s. 0d.; aluminium bronze (BS1400), AB1, £203; AB2, —.

CHAL

mould drying
ovens give
minimum
processing time
with full
thermostatic control

CONTROLLED HEAT & AIR LTD.

Industrial ovens and dust collectors—

SMETHWICK · ENGLAND 5/31/58

PIG IRON

Low Phosphorus
Refined & Cylinder
Hematite
Malleable
Derbyshire
Northamptonshire
Swedish Charcoal

Ferro Silicon (12-14%)
Alloys & Briquettes
N.F. Metals & Alloys
Limestone
Ganister
Moulding Sand
Refractories

WILLIAM JACKS & Co. LTD.
Winchester House, Old Broad Street
TELEPHONE: LONDON WALL 4774 (8 Lines) London, E.C.2.

Birmingham, 2.
39, Corporation Street.
MIDLAND 3375/6.

Liverpool, 2.
13, Rumford Street.
CENTRAL 1558

Glasgow, C.2.
93, Hope Street.
CENTRAL 9969.

F

Company News

PETER BROTHERHOOD, LIMITED, engineers and ironfounders, of Peterborough—Interim dividend of 6 (5) per cent.

MASON & BURNS, LIMITED, malleable ironfounders, of Walsall—A dividend of 10 per cent. for the year ended March 31, 1958, compares with 20 per cent. previously. Net profit is £7,357 (£6,851).

EDWARD G. HERBERT, LIMITED, machine-tool makers and factors, of Levenshulme, Manchester—After tax of £13,282 (£7,943), net profit for the year ended March 31, 1958, amounts to £10,959 (£4,048). A 12½ per cent. dividend is maintained.

CHAMBERLIN & HILL, LIMITED, ironfounders, of Walsall (Staffs)—A distribution of 17½ (15) per cent. is announced for the year to March 31, 1958. Net profit was £23,360 (£20,059). Current assets now stand at £162,868 (£146,747) and liabilities £44,245 (£41,269).

W. H. ALLEN SONS & COMPANY, LIMITED, mechanical, hydraulic, and electrical engineers, of Bedford.—The final dividend is being raised by 1 per cent. to 8½ per cent. to make 11 per cent. for 1957, against 10 per cent. The net profit is higher at £496,655, against £478,208.

BAKER PERKINS, LIMITED, manufacturing engineers and iron, steel, and brass founders, of Peterborough—Stockholders accepted 250,740 of the 252,666 £1 ordinary shares recently offered by way of rights. For the excess balance of 1,926 shares, applications for 54,321 shares were received.

WILLIAM COOK & SONS (SHEFFIELD), LIMITED, steelfounders, etc.—Profits for the year to March 31, 1958, were £100,354 (£75,952). The dividend is maintained at 25 per cent. on capital as increased by last June's one-for-four scrip issue, with an unchanged 15 per cent. final. The company also announces a further one-for-four free scrip issue, for which CIC consent has been obtained.

UNIVERSAL GRINDING WHEEL COMPANY, LIMITED—Results for the first eight months of the current year show some improvement over the corresponding period of the previous year and there is a likelihood that the dividend may be increased. With the maintenance of the interim at 10 per cent., tax free, on the ordinary and employees' stock, the directors propose capitalization of £550,233, in a one-for-one scrip issue.

F. PERKINS, LIMITED, diesel engine manufacturers, of Peterborough (Northants)—Action would be taken on the provision of additional permanent finance as soon as the level of profits permitted, stated the chairman, Mr. F. Perkins. There was only a modest profit for the first five months of the year, but he considered that, provided present trading conditions here and overseas continued, 1958 would show a reasonable turnover and profit.

RANSOMES & RAPIER, LIMITED—At the annual meeting, which will most probably be held in September and not on June 27 as previously intimated, a recommendation will be made of a final dividend of 5 per cent., free of tax, payable in September, making 7 per cent. for 1957, as for the previous year. Last month it was stated that in view of the merger with Newton, Chambers & Company, Limited, having been declared unconditional, no final dividend would be paid for 1957.

GLACIER METAL COMPANY, LIMITED—Group net profits in 1957-58 amounted to £102,421 (£73,811) and the dividend is unchanged at 11½ per cent. During the year work began on a large plant for the manufacture of reticular aluminium-tin bearings and construction of additional factory space will start at Kilmarnock this year. The directors believe that the company will do well to maintain profits in the current year despite a vigorous sales concentration on new and special products.

W. T. HENLEY'S TELEGRAPH WORKS COMPANY, LIMITED—In spite of energetic steps to improve returns, Sir John Dalton, chairman, said he would not like shareholders to take the continuation of the same level of dividend as in any way a guarantee that it would be maintained in the future. Referring to the merger talks with Johnson & Phillips, Limited, engineers and cablemakers, of London, S.E.7, he said that these were still in the early stages and it was too soon to give any likely outcome of the talks.

HALE & HALE (TIPTON), LIMITED, "Blackheart" malleable iron founders—The directors state that the company, like many others, has felt the effect of the disturbances in the field of industry and while not wishing to strike a pessimistic note, they have decided, as a precautionary measure, to pay an interim dividend of 5 per cent. instead of the usual 7½ per cent. They state that the order-book is "surprisingly good." A final dividend of 17½ per cent. made 25 per cent. for the year ended August 4, 1957.

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED—It is proposed to create £25,000,000 of 6 per cent. debenture stock, 1978-83, and arrangements are in hand for the underwriting of £21,550,000 of the issue. This is the full amount, less the amount to be allotted to holders of the 3¼ per cent. 10-year notes, 1954-59, who have agreed to exchange their holdings for allotments of the new stock. The issue price will be £98 10s. per cent., £20 per cent. being payable on application, £50 on July 15, and £28 10s. on September 12.

PLATT BROS. & COMPANY (HOLDINGS), LIMITED, textile and general engineers, etc., of Oldham—The chairman, Mr. K. H. Preston, states that unless orders decline sharply the current year's turnover will equal that of last year, when consolidated revenue advanced from £1,849,590 to £2,565,878 following reorganization. Last year's profits of subsidiaries, included in the group accounts for 1956, show a considerable improvement over that year. New subsidiaries included for the first time made a worthwhile contribution to the improved results. A 15 per cent. dividend compares with 12½ per cent.

J. STONE & COMPANY (HOLDINGS), LIMITED, railway, electrical, and general engineers, of London, S.E.14—Consolidated profits rose to £1,438,313 (£1,072,085) in 1957 and the dividend is raised to 18 (16) per cent. less tax, with a final of 14 per cent. Tax absorbs £811,913 (£508,651), leaving the group net profit £62,966 higher at £626,400. Although the group's order-book at January 1, 1958, was more than 10 per cent. higher than the year before, orders received during the first five months of this year are appreciably less so that the same group profit is not anticipated for 1958.

RANSOMES SIMS & JEFFERIES, LIMITED, agricultural machinery manufacturers, etc., of Ipswich—The 1957 group trading balance of £304,034 (£219,368) is the equivalent of only 6 per cent. on the employed capital and "all that profits will permit" is the maintenance of a 6 per cent. dividend, states Sir Reuben Hunt, chairman, who adds that if selling prices had not been increased last year the company would not have made a profit. The company's interest in its Argentine subsidiary is in course of disposal to Mr. T. H. Jeffrey, who will continue to act as the company's distributor there.